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Empirical Research Paper

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

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ABSTRACT

Societal value co-creation is an emerging practice in renewable energy projects. Despite its increasing popularity, however, unclarity persists 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 the design of societal value co-creation processes in future renewable energy projects.

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 °C 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 (Suskind et al., 2022). Indeed, local stakeholders like community members and municipalities are increasingly objecting plans for RE projects 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 and van der Horst, 2004; Perlaviciute et al., 2021; Suskind et al., 2022). When insufficiently addressed, local resistance can result in unaffordable delays or cancellations of RE projects (Suskind et al., 2022).

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

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they receive as well as on their level of involvement (Keeyns and Hue-mann, 2017; Cook et al., 2022; Mihailova et al., 2022).

Value co-creation is not an established approach yet. Many un-clarities 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 and 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 heterogeneous 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 and 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 and 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 and Michael, 2003; Stirling, 2008; Konrad and 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 and 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, interorganizational 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).

2. Theoretical foundations

2.1. Societal value co-creation in project management

Societal value co-creation is an emerging practice in project development (Keeyns and Hue-mann, 2017) in which social, environmental, and economic benefits are created for and with societal stakeholders around a project (Keeyns and Hue-mann, 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 and Lusch, 2004). Studies on value co-creation in project development have similarly focused on the attempts of developers to include either upstream service providers or downstream users of envisioned project outputs in the development 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 a wider variety of societal stakeholders (Chang et al., 2013; Keeyns and Hue-mann, 2017; Smyth et al., 2018; Candel et al., 2021). One rationale for the inclusion of various stakeholders is that it could improve project performance (Heredia-Rojas et al., 2018). Bringing together heterogeneous 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 and 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 organisations 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 and 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 and 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 and 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 and 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 Keeyes and 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 (Keeyes and 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 and 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 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 remains 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; Keeyes and Huemann, 2017; Whyte et al., 2022).

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 and Raven, 2006). These may be “project-specific expectations” (Budde and Konrad, 2019), such as expectations 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 is 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 and 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 and 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 and Michael, 2003; Konrad, 2006; Pollock and 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 and Palavicino, 2017; Kuhlmann et al., 2019; Hielscher and Kivimaa, 2019). Such organisational formats can either be "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).

2.3. A conceptual 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 and Sloan, 2011, p. 262). Hence, in dialectical thinking, ideas and understandings – and indeed, expectations too – are ever-emergent processes (Van de Ven and 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 and 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 and 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 and 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 Fig. 1).

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 in project meetings (N=19), 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; in 2019, they were organised on a monthly basis). Most core group meetings lasted 2h. 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 irregularly 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 min 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

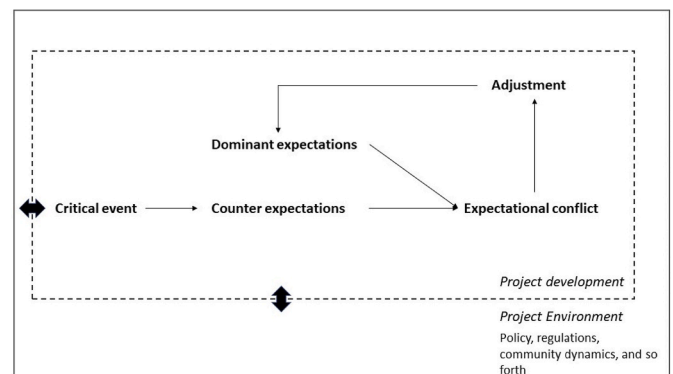


Fig. 1. Expectational dynamics of project-specific expectations in RE projects: a theoretical framework inspired by Van de Ven and Poole (1995).

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 Fig. 2 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 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 and 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 and 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.¹ 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.

4. Results

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 (Fig. 3). 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 producing 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-ha 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 which were the Municipality of Emmen and the Province of Drenthe, to discuss if redevelopment of the site could also contribute to regional policy goals. 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 co-creative 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, EBN, 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

¹ 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.

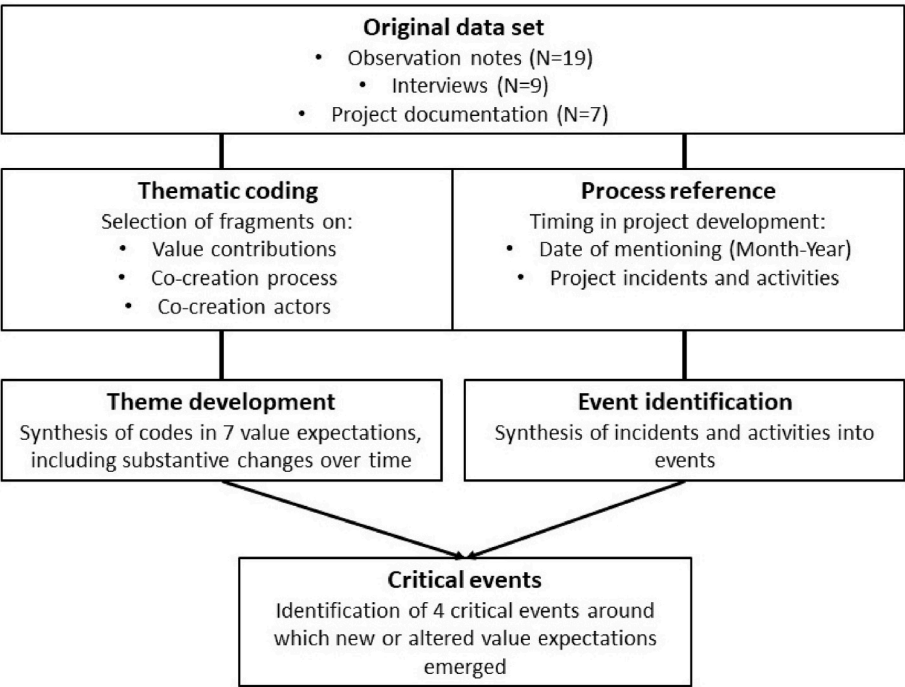


Fig. 2. Overview of the coding process.



Fig. 3. Location of GZI next in Emmen, the Netherlands.

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 Table 1 for an overview).

Table 1

Overview of involved actors in GZI Next 2017-present.

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	(energy) Services and infrastructure provider for the large multi-client (chemical) industrial site in Emmen	2017-present	Hydrogen
ParkEmmen			
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)

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.

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- and longer-term value chains were still 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, together with the CO₂ 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 with the actual integration of energy flows in the project was increasingly embraced and shared amongst the developers (i.e., *the dominant value expectation*). The importance of successful development of GZI Next was also increasingly emphasized, as at least some of the developers 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 large-scale 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 biogas for local communities, or value from additional activities on the site such as the educational Field Lab, could possibly offset any emerging negative feelings towards bio-digestion (i.e., *the adjusted value expectation*).

In summary, Fig. 4 depicts expectational cycle one.

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 products – 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

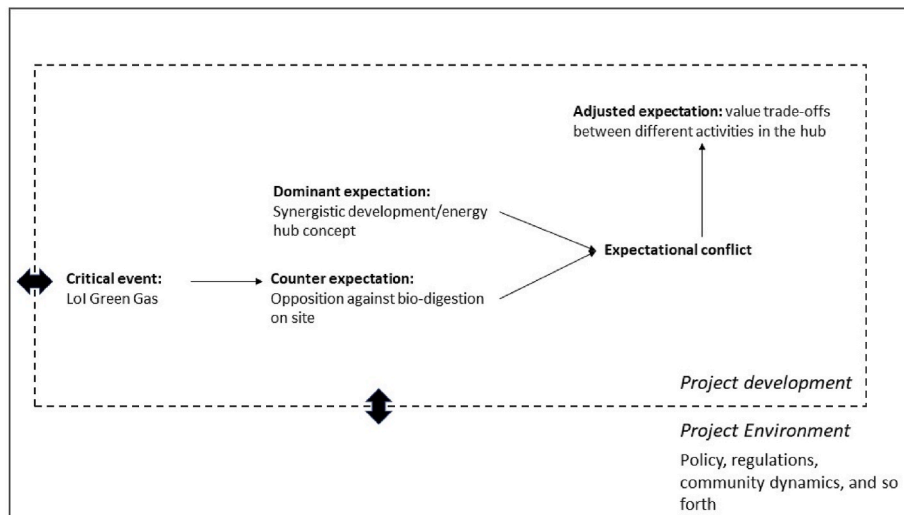


Fig. 4. Dialectical dynamics of expectations – resistance and value trade-offs.

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 12 MW 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 financial or material 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. Secondary factors that also seemed to have played a role 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 considered 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 possibly 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 and 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 of the Solar PV park 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,

1. Re-use of redundant gas infrastructure
2. 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.
3. 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.”

Fig. 5 summarizes the described expectational cycle.

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

The third expectational cycle started when one of the core group

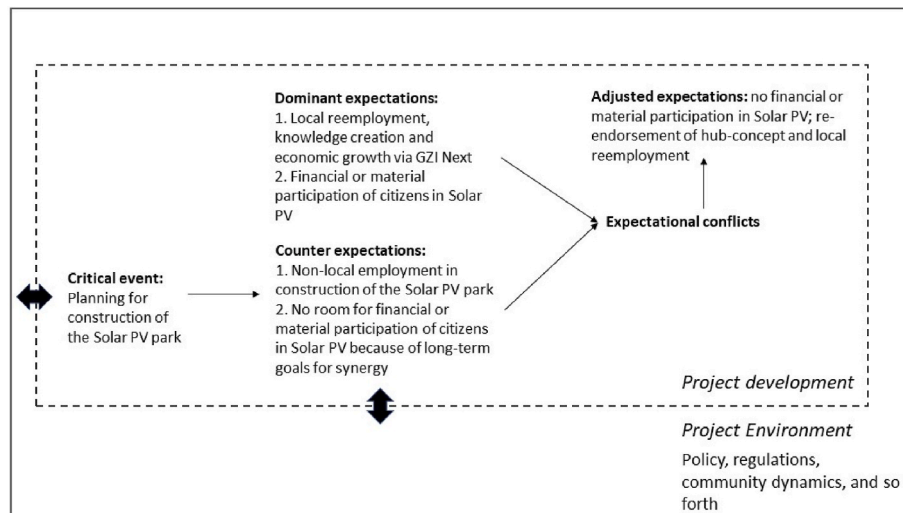


Fig. 5. Dynamics of expectations – expectational conflicts illuminate inconsistencies.

members was approached by a new programme of the Topsector Energy of the Netherlands Enterprise Agency² focused on Responsible Innovation³ [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 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 most likely not help generate new insights. Hence, they preferred engaging with community members through the focus groups and future follow-up dialogues in 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 (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 remained 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

² In Dutch: Rijksdienst voor Ondernemend Nederland.

³ In Dutch: Maatschappelijke Verantwoord Innoveren

the upcoming project development stages. However, they did not display a particular interest in direct involvement in co-creation in the project.

Fig. 6 summarizes the described expectational cycle.

5. Discussion

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 came up with 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 and 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 performativity – 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 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 the 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.

5.1.1. 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 even before 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 the front-end stage, and over the course of project development, 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 project 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.

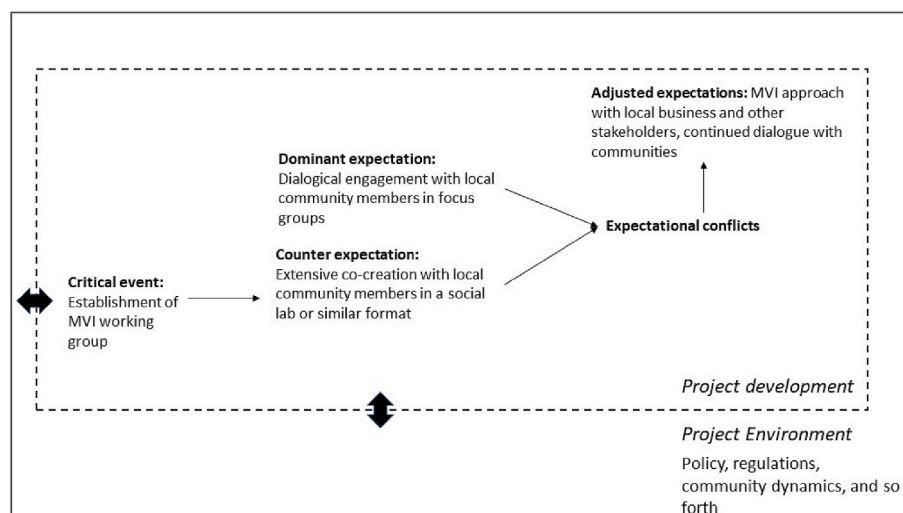


Fig. 6. Dynamics of expectations – continued dialogue or co-creation with citizens.?

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 and 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 turned out 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 the *societal value proposition* remains flexible and proactive towards future community wants, yet such flexibility may create considerable uncertainties for 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 likely want to 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 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 most 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.

5.1.2. 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, reevaluating 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.

5.1.3. Actor positions

Lastly, looking at which expectations become embedded in project development, and which do not, *actor positions* emerge as relevant. Ideally, co-creation revolves around an equal partnership between heterogeneous 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 the realisation 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.

5.2. 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.

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 of when to open up or close 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.

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Data availability

The authors do not have permission to share data.

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