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Article

Key Tensions in the Development of Regional Heat Infrastructure in The Netherlands: The Dilemmas of an Interorganizational Strategy Process

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Abstract: The proposed solutions for sustainable development generally require new links and the involvement of multiple sectors. As a consequence, organizations can rely less on closed and rational analysis-based forms of strategizing; they increasingly see the need for joint strategy processes. However, a joint strategy process challenges the boundaries of the organizations involved, which creates tensions. This paper takes stock of conflicts and uncertainties that organizations which become involved in joint strategizing encounter. Our focal point is the sustainable development of infrastructure. We focus on an explorative single case study on the coordination of heat infrastructure development in the Regional Energy Strategy Rotterdam-The Hague (RES R-TH). The primary data were collected via three sources of information: observations from roundtable meetings, interviews with representatives of the organizations involved in the RES-TH and reflections from participants of these actors in research-led ateliers. We illuminate a wide range of tensions between organizations and identify three categories of dilemmas: input, throughput and outcome. By explicating dilemmas and identifying categories, we discard the idea that a universal solution exists for organizations engaging in joint strategizing. Instead, we provide evidence of different types of decision-making challenges, which emerges from a more granular analysis of the open strategizing process.

Keywords: energy sustainability; infrastructure; sustainable development; open strategy; interorganizational strategizing; dilemma

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1. Introduction

Due to the dynamic uncertainties in their environment, organizations increasingly look for new ways to formulate and implement strategies [1,2]. By following a more inclusive approach, for example, organizations can widen the search for ideas [3]. A radical example is provided by the German Premium Cola collective, taking open strategizing to the extreme by allowing many of its stakeholders to set strategy agendas, participate in strategy deliberations and contribute to decision-making on a continuous basis [4]. Another empirical example is Siemens. This German multinational announced a broad initiative to gather and discuss ideas for sustainable value creation and capital-efficient growth [5]. The examples show how a strategy can change based on higher levels of inclusion. This can have a wide range of benefits for an organization, such as generating creative ideas, legitimizing strategy decisions or fostering an organizational identity [6]. To make sense of

this phenomenon where organizations take a different approach to strategy, a concept called "open strategy" was put forth [3,7]. A key starting point of open strategy research is asking why and how strategy extends beyond the traditional boundaries of the organization.

In today's society, growing interdependencies seem to characterize and perhaps even define the crises and problems organizations face [8]. Confronted with a variety of complex, systemic and interdependent challenges and problems, organizations increasingly feel the need to cross organizational boundaries [9]. This often involves the development of new ways of decision-making and interorganizational strategizing [10]. Interorganizational strategizing is defined as 'engaging in a strategy process jointly with other organizations' [11] (p. 106). While multiple studies have focused on intra-organizational tensions of open strategy [7,12,13], the attention on the challenges of interorganizational strategy remains limited. For example, few empirical studies explicitly examine how a strategy process opens up to a variety of actors [9,14]. A focus on interorganizational strategizing creates an avenue to focus more on the implications of interorganizational dynamics [6,9,10]. To generate a better understanding of the decision-making challenges of interorganizational strategizing, we pay attention to the tensions between organizations induced by the strategy process. The tensions induced by new, more open forms of strategy can either support or block change in decision-making [15]. Currently, our understanding of these tensions is limited [12].

The aim of this study is to enrich our understanding of the tensions that organizations encounter in an interorganizational strategy process on the sustainable development of infrastructure. We refer to dilemmas as manifestations of difficult choices between two alternatives that characterize the interorganizational strategy process [15–17]. We regard dilemmas as explicit focal points of tensions between perspectives of the various organizational actors involved and hence indicative for the positions of organizations to key alternatives and uncertainties in their decision-making process. Actors involved in interorganizational strategizing hold various views towards alternatives and uncertainties in the process. Moreover, in situations where different implicit views explicitly conflict, these different perspectives become in focus. Hence, an explicit focus on dilemmas illuminates tensions underlaying the entire strategy process and enables a fuller understanding of these tensions in their multi-actor context. This understanding in turn allows for reflection and the possibility for meaningful change to that process [15,18].

In this study, we focus on infrastructure and its sustainable development. We refer to infrastructure as the immovable assets for transport processes [19]. Examples include roads, rails, pipelines or cables allowing for transport of persons, goods, water, data, energy and more and, as such, providing crucial societal services by delivering them at the locations they are needed. These transport processes are part and parcel of key economic and social activities, making the infrastructures one of the linking pins when these activities are in flux. Over the years, the drive toward sustainable development has led to a new outlook in the domain of infrastructure [20,21]. System transitions are expected to support sustainable economic development and improve environmental outcomes [21]. The boundaries of many organizations are challenged, since the proposed solutions generally require new links and the involvement of multiple sectors. For example, charging points for electric vehicles newly connect automobility with the energy sector and the public space providing loading facilities. Therefore, coordinating the development of charging points generally requires the involvement of multiple sectors. This increases the need for interorganizational collaboration to improve integral and synergetic decision-making [20,22–24]. However, there is a lack of attention on the tensions that surface in interorganizational decision-making on sustainable development [25]. Our research question is "What dilemmas can be identified during an interorganizational strategy process on the sustainable development of infrastructure?".

Interorganizational decision-making on strategy may occur at different spatial and organizational levels [11]. One way to organise an interorganizational strategy process is via integrative, collaborative processes on a regional level. This paper is based on

an explorative single case study on the coordination of heat infrastructure development in the Regional Energy Strategy Rotterdam-The Hague (RES R-TH). The primary data were collected using three sources of information: observations from roundtable meetings, interviews with representatives of the organizations involved in the RES-TH and reflections from participants of these actors in research-led ateliers.

The structure of this paper is as follows. Section 2 discusses the theory. Then, Section 3 discusses the methodology and provides the case description. Section 4 discusses the results. Then, Section 5 provides a discussion.

2. Theory

2.1. Perspectives on Open Strategy

According to the literature review of Tavakoli, Schlagwein and Schoder [6], there is implicit consensus that "open strategy" is a novel phenomenon worthy of dedicated study. Although multiple studies have incorporated the theme of openness or involvement into strategy research for many decades [26], the notion that "strategy doings" take place across organizational boundaries prompted a wave of scholarly interest in this new perspective [27,28]. However, there is no consensus about what precisely open strategy is, nor how it should be theoretically approached [29]. Tavakoli, Schlagwein and Schoder [6] further conclude that there are very different views on what constitutes "strategy" (ontology) and, hence, how knowledge claims can be made about it (epistemology). One view on strategy, the process view, addresses the issue of how strategy develops over time [6]. In this view, opening up strategy refers to a process, rather than a final state [3]. An example is the process model on interorganizational strategy of Hettich and Kreutzer [10]. Open strategy takes decision-making as a focal point for assessing the openness of strategy processes [28]. However, only a few open strategy studies focus on the involvement of large groups of external actors [9,14]. Moreover, the links between open strategy and interorganizational strategizing are not always explicit [10]. In some cases, there is no link to openness at all [30]. In this study, we focus on interorganizational strategizing to better understand the "process view" of open strategy and the implications of interorganizational dynamics.

2.2. Interorganizational Strategizing and Dilemmas

One strand of strategy research in particular is focused on dilemmas [7]. This interest in dilemmas follows from a lack of understanding about how strategy processes are opened up (or not) [9,14,31] and the conflicts and uncertainties that characterize an interorganizational strategy process [7,16,17]. Dilemmas are expected to illuminate these underlaying tensions and produce insights into how joint strategy processes are undertaken in practice and what it means for organizations to engage in them. The insights thus generated can support organizations in identifying decision-making challenges and enriching the substantive discussions [15], since opening up strategy is unlikely ever to be universal [3]. Indeed, the essence of working and thinking in dilemmas is to discard the idea that a single ideal solution exists that solves all problems [32]. Instead, dilemmas are best understood through a consideration of trade-offs [17,33]. However, a dilemma is an ambiguous concept that lacks a clear definition [34,35]. In this study, dilemmas constitute difficult choices between two alternatives that characterize the interorganizational strategy process [15]. They are manifestations of conflicts and uncertainties that can be traced back to the strategy process. The conflicts are understood as conflicting interests and/or preferences between organizations, which differs from other interpretations of conflicts that emphasize societal values [36] or organizational ambidexterity [16,35]. Importantly, the term strategy process can have two different meanings: the decision-making process and the change itself [37]. This is because the choice itself cannot be identified but rather emerges during the strategy process [38]. We expect that, when the underlaying tensions remain obscured, an opportunity for integral and synergistic decision-making is lost. Hautz, Seidl and Whittington [7] present a short list of dilemmas that are typically associated with opening up strategy. However, there is a strong need for empirical context to give

dilemmas more meaning [34,39]. Therefore, this study focuses on an interorganizational strategy process on the sustainable development of infrastructure.

2.3. The Organizational Need to Engage in Strategy on the Sustainable Development of Infrastructure

To provide our study of conflicts and uncertainties in joint strategizing with a rich, empirical context, we turn to the domain of infrastructure. Infrastructure and strategy are closely intertwined. This is because the long life cycle of assets calls for a long-term perspective on infrastructure development [23]. Infrastructure development is also increasingly linked to sustainability objectives [20,21,40] in organizational strategies. However, often times the plans affect multiple organizations and sectors. This creates a strong impulse to strategize across traditional boundaries [22,23,41]. For example, electrifying vehicles requires charging points. Increasing the amount of charging points may affect the built environment, energy, mobility and logistics sectors. Furthermore, how and where charging points are built depends on both investment decisions and spatial planning. Hence, investment decisions and spatial planning are interrelated. This all increases the need for interorganizational collaboration [20,42]. However, the characteristically long life cycle of assets means that the majority of existing assets have been built with different objectives in mind [43]. In addition, infrastructural sectors in many countries have traditionally developed in silos [44]. For these reasons, it is expected to be challenging for public and private organizations to engage in an interorganizational strategy process. Hence, strategy on the development of sustainable infrastructure is our focal point of attention.

3. Research Design and Methodology

This study focusses on an explorative single case study. The interorganizational strategy process takes place in the RES Rotterdam-The Hague [hereafter: RES R-TH] in the Province of South Holland, The Netherlands. Information on case selection, case description, data collection, as well as coding and analysis, is presented below.

3.1. Case Selection

The RES R-TH case was selected because of (i) its explicit focus on a joint strategy process for the coordination of sustainable infrastructure development and (ii) its extensive network of local and regional actors which also met and discussed these topics at length. We selected this case out of a population of interorganizational strategy processes on the development of sustainable infrastructure (see also previous chapter). We opted for a single case study approach due to the exploratory nature of this research. By focusing our capacity on the analysis of a single case, we set out to obtain a detailed and thorough overview of potentially relevant themes, patterns and relationships in the case [45].

3.2. Case Description

The area of Rotterdam-The Hague has historically been a region with much social and economic activity. It is densely populated and home to more than two million people and 100,000 companies, including vast areas of greenhouse horticulture. It is also home to the Port of Rotterdam, the largest seaport in Europe [46]. The region's energy and heat demand is diverse and is met in different ways. Although the vast majority of domestic and commercial users rely on natural gas for heating purposes, there are also multiple heat systems in place. Parts of the city of Rotterdam as well as some of the surrounding areas have had access to residual industrial heat for decades. This heat is transported to the built environment through three regional heat pipelines (Nieuwe Warmteweg, Leiding over Noord and the B-driehoek pipeline) and, on the neighbourhood level, a patchwork of heat grids [47]. Moreover, new projects were now in the process of development. An example is the regional pipeline called WarmtelinQ, which was to transport residual heat from the Port area all the way to The Hague and beyond.

Given the carbon dioxide reduction targets in the 2019 Climate Accord [48], the need to phase out natural gas for heating purposes and the transition to new and renewable energy solutions were high on the political agenda in the Netherlands. To accelerate this transition and focus more on the regional scale, the RES programme was set up. An explicit goal of this programme was to support the heat transition in the built environment [48] and included the coordination of regional heat infrastructure development [49,50]. The nation was divided into thirty areas, designated as RES regions. Every region was required to formulate a regional heat vision with multiple components, including 'how the region intends to connect available sources, heating demand and infrastructure . . . and how stakeholders wish to be involved moving forward' [50] (p. 235). In addition, every municipality was required to formulate a heat vision as well [51,52]. The formal RES parties, consisting of 21 municipalities, 4 water boards and the Province of South Holland, invited a large variety of local and regional actors to jointly develop the regional heat vision. For example, business and industry parties, citizen representatives, grid operators and energy companies [46]. The regional heat vision was particularly relevant for the RES R-TH, since there was ample opportunity to develop regional heat infrastructure by coupling together new and existing sources, grids, pipelines and users.

The regional vision was published in March 2021 and by the summer, most municipalities had finished their visions as well [52]. On the basis of the regional heat vision, the RES R-TH devised a number of key programmes to coordinate the development of regional heat infrastructure [46] (see Table 1). For example, to discuss possible links between the new WarmtelinQ project (key programme 2a) and the heat systems Westland and Oostland (key programme 3 and 4). From the summer of 2021 onwards, the main aim was to put the plans into practise. The formal RES parties were in the lead to coordinate regional development with a wide plethora of other actors.

Table 1. Overview of the key programmes Regional Energy Strategy Rotterdam-The Hague (RES-TH).

#	Key Programme
1	Energy savings and regional support to local challenges
2a	WarmtelinQ
2b	Development of geothermal energy Delft-The Hague
3	Heat system Westland
4	Heat system Oostland
5	Optimizing use of existing assets
6	Heat system/development geothermal energy Voorne-Putten
7	Exploring opportunities Rotterdam-East

3.3. Collecting Case Data

To get a better understanding of the conflicts and uncertainties of the interorganizational strategy process, we applied methodological triangulation to verify our interpretations [45]. Primary data collection was based on observations from the key programmes, interviews with representatives of the actors involved in the RES-TH and reflections from participants of these actors in research-led ateliers. All of the primary data were collected between June 2021 and January of 2022 and were part of a study, commissioned by the RES organization, to explore the long-term governance and strategy preferences of the actors involved [53].

First, we observed the actor representatives during meetings of the key programmes. The meetings lasted between 90 min to 2 h and were attended by the RES parties and research institutions. The meetings were recorded, transcribed, coded and analysed.

In addition, we conducted 14 interviews with respondents which represented a diverse group of actors that took part in one or multiple heat projects or were otherwise involved in the RES R-TH. The character of these actors range from the local to the national level (see Table 2). Due to COVID considerations, the interviews were largely carried out

online. Most interviews lasted about 1 h. The interviews were recorded, transcribed, coded and analyzed.

Table 2. Overview interviews.

Actor	Relevance to Case	Date
Afvalverwerking Rijnmond (AVR)	Waste company that supplies residual heat from a nearby plant	5 August 2021
Greenport West-Holland	Regional public-private network organization focused on horticulture (partnered with several formal RES parties)	5 August 2021
Huisvuilcentrale Noord-Holland	Waste company involved in the heat transition	13 August 2021
Uniper Benelux	Energy company with heat assets, including the RoCa plant and B-driehoek pipeline	17 August 2021
Energie Samen	National cooperative and interest group of sustainable energy communities of citizens	30 August 2021
Energie Beheer Nederland	Independently operating 'policy holding', focusing on gas, heat, CCS and transport systems	31 August 21
Invest-NL	National innovation fund focused on societal transitions	1 September 2021
Westland Infra and Capturam	Regional infrastructure operator (electricity, gas and heat)	1 September 2021
Eneco	Energy company with heat assets, including the Leiding over Noord pipeline	6 September 2021
Warmte Samenwerking Oostland	Collaboration between municipalities (including several formal RES parties) and horticulture on regional heat infrastructure	14 September 2021
Warmtebedrijf Rotterdam	Owner of Nieuwe Warmteweg pipeline and focused on transport and exploitation of residual heat	23 September 2021
Netverder	National infrastructure operator focused on heat, steam and biogas	25 October 2021
Ministerie van Economische Zaken en Klimaat	The Ministry of Economic Affairs and Climate Policy in the Netherlands.	3 December 2021
Autoriteit Consument & Markt	National regulatory authority in the Netherlands. Regulates different markets in order to safeguard affordability, quality, continuity and accessibility	19 January 2022

Thirdly, we organized reflections on our emerging insights with a wider group of actors in 2 heat ateliers (see Table 3). The first atelier was attended by non-governmental actors and the second by the formal RES parties. Reflections, concerns and additional comments of the participants were taken forward in the following analysis.

Table 3. Overview of the key programmes RES R-TH.

Heat Atelier	Date
Attended by 18 actors	27 September 2021
Attended by RES parties	1 October 2021

Additionally, the analysis was supplemented by secondary data, as we gathered around 10 to 15 documents (ranging from policy documents to essays) focused on the coordination of (regional) heat infrastructure development in the Netherlands and often times the RES R-TH in particular.

3.4. Coding and Analysing Case Data

An iterative, interpretative process was used to code and analyse the primary data. The first step in coding involved identifying and selecting text fragments that contained statements about what was desired or required for the coordination of regional heat infrastructure development. In addition, we looked for significant uncertainties. Every statement was linked to an actor type, e.g., formal RES party, local actor and/or private actor. This resulted in a preliminary overview of conflicts and uncertainties. Fragments that described the same tensions were grouped into 15 themes around which multi-actor issues emerged (see Figure 1). Next, based on the themes, we conducted a more thorough second round. During the second round, we identified 9 difficult choices between two alternatives that illuminated explicit focal points of tensions in the interorganizational strategy process. During the course of the second round, patterns between subsets of dilemmas became apparent. Based on our observations, the dilemmas were grouped into three categories: input, throughput (or process) and outcome. These groups resemble elements of the 'logic model' [54], which comes from systems thinking and is often applied in management studies, for example to evaluate (inter)organizational coordination and performance [55–58]. The three categories are not meant to conceptualize the interorganizational strategy process but to help provide a more granular view of the types of dilemmas organizations may encounter within it.

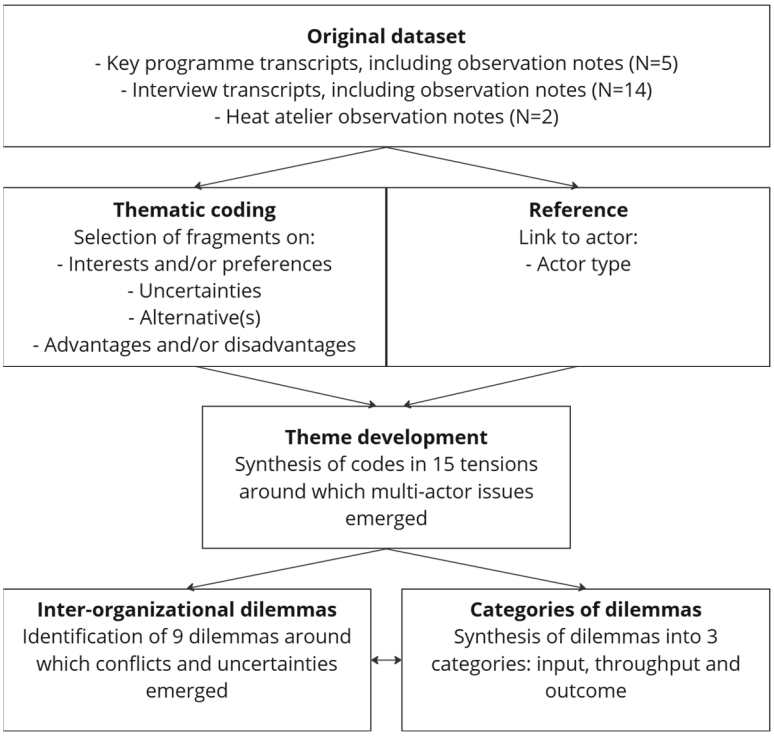


Figure 1. Overview of the coding process.

4. Case Results

The analysis resulted in the identification of nine dilemmas that organizations of the RES-TH encountered. The dilemmas illuminate tensions underlaying the coordination of regional heat infrastructure development. The analysis further revealed three groups of dilemmas. The first group of dilemmas we identified centres around the starting conditions. What is the basis for the organizations to engage in a joint strategy process? Next, the second group of dilemmas deals with coordination between actors to align their resources. The tensions focus on how to calibrate the resource configurations when the strategy process is in a constant flux. Finally, the third group of dilemmas centres around the competing views on desired outcomes. An overview of the dilemmas is given in Table 4.

Table 4. Overview of the identified dilemmas in the interorganizational strategy process of the RES-TH.

Input	Throughput	Outcome
Supporting participation	Projects and processes	Flows of finance
The ruling of roles	Scaling synergy	The principle price
Coursing consensus	Integral parts	The issue of time

The reader might have wondered why the dilemmas were given conspicuous names, seemingly incongruous with our theoretical presuppositions. Upon re-examination, however, "supporting participation", for example, can be interpreted as supporting a participatory approach (an end) or as a participatory approach to support a joint strategy process (means to an end). Similarly, "coursing consensus" can be interpreted as actively setting a course or letting something run its course. It is meant to illustrate the notion that many tensions underlaying the strategy process can be understood as different sides of the same coin.

4.1. Dilemmas Centred on Input

The common thread in the first group of dilemmas is the interest of actors in how to organize the decision-making, the structures that facilitate it and their lasting significance. These choices have implications for the design of the interorganizational strategy process.

The first dilemma ("supporting participation") is whether to increase or decrease participation and substantive input of stakeholders. This requires attention on what it means to participate and whether it is a means to an end [51]. Studies commissioned by the province and the RES R-TH showed that, leading up to the regional heat vision, there were different approaches to participation. This showed, for example, in the level of participation of local and regional actors [59,60]. This begs the question: What does it mean to participate? Called "the real challenge" during the first heat atelier, participation is about how to get everyone on board, the actors concluded. However, this proved to be a much more intricate problem in practise, as tensions continued to linger on. The interviews showed that many actors were in favour of more openness, believing that the benefit is finding common ground, being able to align different objectives and preventing the process from stalling later on. However, the disadvantage of more openness would be compromising speed. Other actors believed decreasing the openness was the preferable route. Amongst others, these actors warned about the growing complexity of decision-making, the risk of "politization" and/or becoming "too regional".

The second dilemma ("the ruling of roles") is whether to initiate collaboration between actors based on either equal terms or mutual interest. This requires attention on the way in which roles of the formal RES parties and actors involved are defined and expected to grow. Naturally, there are hierarchical differences between municipalities, water boards and the province. However, from the beginning the formal RES parties were 'designed to be coequal partners, which was meant to foster collaboration' [61]. Furthermore, with regard to the coordination of heat infrastructure development, the guiding principle was that municipalities are in the lead [46]. This begs the question: what exactly are the roles in practise? There were several ambiguities in the design of the strategy process or, as Van der Steen, Boogaard, Jansen, Westerweel and Koopmans [32] (p. 27) put it, 'an interesting blend of autonomy and co-governance with elements of both'. Furthermore, new roles are not adopted overnight. On the one hand, designing rules of collaboration helps to define roles into the future, creating shared responsibilities and mutual benefits. However, the wide variety of local circumstances made it difficult to get actors on the same page. On the other hand, prioritizing mutual benefit creates more space for organic coalition-building. Building relationships is complicated, slow and therefore takes time.

The third dilemma ("coursing consensus") is whether to work with the RES as an ongoing process or as a set of decision points. What is the rationale for the RES? What

is the heat infrastructure going to look like? And how will the rationale for the RES and developments in heat infrastructure mutually affect one another? Why are some actors referring to the "RES 2.0", while others aren't? As Van der Steen, Boogaard, Jansen, Westerweel and Koopmans [32] (p. 24) put it, 'Is the RES a dot or a comma?'. There was a stark contrast between the key programmes in terms of general attitude to the RES. This was in part because the status of infrastructure development differed between them. Multiple municipalities in key programmes 2 and 5 had a positive attitude toward the RES and considered it an ongoing process, a central node to create synergy between the municipal plans. Moreover, in key programme 3, municipalities already referred to the RES 2.0 (as a future milestone). In addition, the RES 2.0 is also explicitly mentioned in multiple evaluation studies [51,52,62]. However, in key programme 3, where the RES was discussed extensively, several actors voiced their doubts on its added value, while, in key programme 6, there was a noticeable silence on the matter. In these key programmes, the infrastructure development was already underway. Instead, the actors there were looking to the province for a more collaborative relationship. According to various actors, the existing structures sufficed, and the preference therefore was to let the coalitions run their course. An overview of the dilemmas is given below in Table 5.

Table 5. Overview input dilemmas.

←	**Input Dilemma**	→
Increasing openness to participation and substantive input	Supporting participation	Decreasing openness to participation and substantive input
Initiate collaboration between RES parties based on equal terms	The ruling of roles	Initiate collaboration between RES parties based on mutual interest
Working with the RES as an ongoing process	Coursing consensus	Working with the RES as a set of decision points

In conclusion, the input dilemmas show that there are a number of issues around the basis for the organizations to engage in a joint strategy process. The first dilemma, for example, "supporting participation", shows that there are different approaches to participation, each with a very precise yet different interpretation of the meaning of openness. Even though principles on how to organize the decision-making had been put in place, input dilemmas still surfaced. The emergence of input dilemmas pose a fundamental question: To what extent are the actors at an advantage or disadvantage, when difficult choices are not explicated prior to the sound of the starting pistol?

4.2. Dilemmas Centred on Throughput

The common thread in the second group of dilemmas is that they all deal with interdependencies between actors. The various resources that the actors commit to the strategizing process need to be allocated somehow, while taking into consideration both the resource availability and the time. For example, the limited human capital of the RES parties means people cannot be in two places at the same time. This allocation, in turn, cascades through the interorganizational strategy process. The tensions focus on how to calibrate the resource configurations when the strategy process is in a constant flux.

The first dilemma ("projects and processes") is whether to prioritize projects that contribute to processes or to prioritize processes that contribute to projects. A focal point in this dilemma is the WarmtelinQ project, which key programme 2 is dedicated toward. The very presence of this key programme and the outspoken ambivalence about its purpose by formal RES parties are clear manifestations of the underlaying tensions. Is the resulting pipeline the desired backbone of heat infrastructure, able to catalyze regional development? Municipalities are divided on this subject. While some are interested, others don't expect to need heat from other sources elsewhere in the region. Several actors prefer to initially think

in small steps and focus on smaller sources, gradually exploring opportunities for synergy, like stringing together beads [63]. However, a singular focus on projects may inadvertently limit these opportunities, as the momentum of projects can alter the efficacy of the joint strategy process. For example, multiple actors warned about the risks of lock-in effects. Yet others warned about a lack of ownership when the emphasis is on process management. During one of the key programmes, a municipality pointed out that the formal RES parties were very focused on how to organize everything. At the same time, however, they "never needed to take risks".

The second dilemma ("scaling synergy") is whether to follow a bottom-up or top-down approach to the coordination of regional heat infrastructure development. For many actors, also with a national character, the local level was the first priority. According to them, the local level is "where the game is played", and therefore, the efforts must be directed "as local as possible" where the situation needs to be "fully embraced". However, other actors experience a void due to a lack of national vision and guidance, which legitimizes delays and indecision on the local level. Persistent, equivocal stances by local governments can lead to seemingly insurmountable obstacles, with one actor admitting they were once "about to eat their shoes". The two ends and the tension between the two approaches was explicitly addressed in key programme 3, where a small-scale bottom-up initiative was discussed. A larger scale would be beneficial for the region, but it will take several years before the interest of the national government is triggered, a municipality concluded. Another factor that complicates the dilemma is the way the RES regions are drawn. When the WarmtelinQ project is crossing over to other RES regions, for example, or when the RES regions do not align with the service areas of grid operators; it is unclear what a local or regional approach entails exactly.

The third dilemma ("integral parts") is whether to focus on decentralized heat or centralized energy. It centres around the trade-offs between different types of heat and its interlinkage with the wider energy system. Various actors had a singular focus on local, geothermal heat. However, there were also actors that preferred to wait with geothermal energy, given the additional risks. The heat ateliers showed how both the RES parties and regional actors were divided on the question of prioritizing geothermal or residual heat. Multiple actors warned that an increasing dependence on residual heat could potentially hamper the development of other heat sources such as geothermal or aquathermal heat. According to multiple actors, the discussion needed to be focused on bundling instead. Furthermore, the heat ateliers also showed that the majority of actors were in favour of integral energy solutions. This begs the question: What is an integral energy solution? Some actors made comparisons with gas and electricity, which others were opposed to. Several actors wanted to steer away from a dependence on a single commodity. One actor envisioned an "integral cross-sectoral approach", where multiple energy carriers would be combined. An overview of the throughput dilemmas is given below in Table 6.

Table 6. Overview of the throughput dilemmas.

←	**Throughput-Dilemma**	→
Initiate projects that will contribute to processes	Projects and processes	Initiate processes that will contribute to projects
Following a (local) bottom-up approach	Scaling synergy	Following a (national) top down approach
Focus on decentralized heat	Integral parts	Focus on centralized energy

It can be concluded that the throughput dilemmas show a variety of preferences on resource configurations. The actors attempt to align and coordinate their various activities to achieve cohesive resource configurations, yet the interdependencies between them make resource allocation challenging. The results indicate that the possibilities for alignment are easily obscured when the process is in a constant flux. The actors appear to switch between perspectives but not very deliberately.

4.3. Dilemmas Centred on Outcome

The theme of the third group of dilemmas is coping with conflicts between desired outcomes of the actors involved. The actors differ in their objectives, which creates tensions in the strategy process. For example, on how to align different objectives and finding common ground or on how to safeguard the delicate balance between public and private interests across time.

The first dilemma ("flows of finance") is whether to increase the share of private or public investments in heat infrastructure. The balance of societal costs was a subject that required "due political consideration". Multiple private organizations wanted business cases to be at the forefront of the strategy process. At this stage, the initial capital expenditures and financial risks were high. Therefore, there were calls to increase the share of public investments in heat infrastructure. For example, to safeguard public values. Multiple municipalities voiced concerns that the WarmtelinQ project, an undertaking led by a state-owned enterprise, would not adequately safeguard public values. The concerns were also present in discussions on the existing pipelines (Leiding over Noord and B-driehoek), which were owned by private organizations. Nevertheless, many public actors were focused on lowering societal costs. Many municipalities though were hesitant to take risks, after a financial debacle in Rotterdam years earlier [64]. In that case, the Municipality of Rotterdam faced the prospect of losing hundreds of millions of euros due to its investment in the Warmtebedrijf, a municipal heating enterprise that encountered substantial financial losses from unfavourable contracts and unanticipated project complications [64].

The second dilemma ("the principle price") is whether to prioritize financial costs over broader societal goals or vice versa. For several actors, the financial perspective was paramount. For example, in key programme 6, alternatives for gas were considered exclusively from a financial perspective. There were critical attitudes toward the scaled development of geothermal heat, which was a core focus of other actors to develop more sustainable heat. In addition, there were concerns about the future societal impact of large assets such as the WarmtelinQ and the B-driehoek pipelines. For example, multiple municipalities were inquiring about further details on the phased approach of WarmtelinQ toward sustainable heat. The uncertainty complicated the discussions. While the volume of residual heat provides an impulse to scale-up and develop regional infrastructure, it may also reinforce the dependency on fossil-based industry. Nevertheless, the heat ateliers showed that the majority of formal RES parties and regional actors underscored the advantages of residual heat for the development of heat systems.

The third dilemma ("the issue of time") is whether to focus on the short-term or the long-term. Multiple actors were keenly focused on short-term gains. The heat market is in the process of development and that needs to be accelerated. The governance "will follow at the end". The heat ateliers also showed that the vast majority of actors believed in the necessity of short-term gains. In key programme 7, there was a need to "break away from endless discussions", while, in key programme 2, the municipalities were faced with a number of decisions on WarmtelinQ simultaneously. However, the discussion then turned to the "puzzle across time". From a regional perspective, synergy requires attention to the speed, scale and sequence of heat grid developments. The heat ateliers showed that various actors were in favour of long-term perspectives, long-term contracts and designing/committing to alternatives for future growth in current projects. However, as several actors wondered, how do you make sure that, from the beginning, you are stringing together beads? How to incorporate and uphold rules that will only be relevant 15 years from now? The long-term perspective is complicated by a fuzzy set of time frames. While there are objectives and scenario's targeting 2030 and 2050, the key programmes address many time frames that are scattered and misaligned. An overview of the outcome dilemmas is given below in Table 7.

Table 7. Overview of the outcome dilemmas.

←	Outcome Dilemma	→
Increasing share of private investments in heat infrastructure	Flows of finance	Increasing share of public investments in heat infrastructure
Prioritize financial costs over broader societal goals	The principle price	Prioritize broader societal goals over financial costs
Focus on short-term gains	The issue of time	Focus on long-term perspective

In conclusion, the outcome dilemmas highlight the various competing views on desired outcomes and the conflicts between them. The iterative switching between views predominated the discussions, since actors naturally assign the most weight to their own objectives. However, this is often times not explicitly recognized. The third dilemma, for example, "the issue of time", shows how various actors are inclined to focus on short-term gains when there are also objectives for 2030 and 2050. This demands more attention, as strategic actor interests may be relegated as a consequence.

A more elaborate overview of the nine identified dilemmas is given in Figure 2. The figure is not meant to be a comprehensive overview of either the involved organizations or their interests in the strategy process. The purpose of the figure is to showcase how a focus on dilemmas can help to illuminate key tensions between actors underlaying the strategy process.



Figure 2. Overview of the identified dilemmas in the interorganizational RES-TH strategy process. The figure visualizes the tensions between actors we highlighted and is not meant to be a comprehensive overview of either the involved organizations or their interests in the strategy process.

5. Discussion

5.1. The Strategy Process of the RES Rotterdam-The Hague

Even though the RES R-TH was a formalized process and part of a national programme, the willingness of public and private actors to engage in a joint strategy process was apparent and was an important characteristic. The results illuminated conflicts and uncertainties underlaying the process and also how explicating both ends of a dilemma generates a better understanding of the type of decision-making challenges the actors were faced with. While the identified dilemmas are not exhaustive, they provide a number of significant insights. For example, many tensions can be understood as different sides of the same coin. Furthermore, that coping with those tensons may require a broader outlook on what is happening concurrently. Even though the timespan of the case data was limited, we identified a variety of dilemmas that illustrate a wide range of tensions. The focus on dilemmas puts these challenges of the RES R-TH into perspective. Rather than indicating a list of problems that need to be solved, the dilemmas highlight significant decision-making challenges that need to be navigated.

5.2. Dilemmas of Interorganizational Strategizing

The three categories of dilemmas provide a richer, more granular view of the tensions that actors are faced with in interorganizational strategy processes. By distinguishing between input, throughput and outcome, we structured our understanding on the type of decision-making challenges that can be expected. The categories help to bring the disinterest and conflicts between actors into focus.

The first group of dilemmas, centred on input, provides a number of focus areas for interorganizational strategizing and how it develops in practise [10]. The roles that actors take on, for example (see "ruling of roles" dilemma), has received little attention in research [11]. Moreover, the input dilemmas are particularly relevant for strategy-making from a public perspective [9], for example, when consensus might be lacking (see "coursing consensus" dilemma). The input dilemmas resembles the open strategy dilemmas as identified by Hautz, Seidl and Whittington [7]. However, these dilemmas emphasize intra-organizational processes. By shifting the focus to interorganizational processes, we show that, in a network of actors, similar dilemmas can emerge (e.g., around participation).

The second group of dilemmas, centred on throughput, seems well aligned with the process perspective on strategy. Here, the perspective is expected to shed more light on the intricate longitudinal aspects of developing a joint strategy. The temporality of strategy requires more research [27]. The process model of Hettich and Kreutzer [10] has advanced our understanding in this area. More attention on process management [15] and the complexity of the actor arena is expected to further break open the black box of joint strategizing [54]. Emerging concepts such as "prospective resourcing" [65] appear promising.

The third group of dilemmas, centred on outcome, shows the stark contrast between desired outcomes of joint strategy. This indicates that the rationale for engaging in joint strategy can differ significantly between actors. For example, actor objectives can have multiple underlying public values [66]. Therefore, research has shown an interest in the shift from exclusive top-down to multi-value strategies [15,18,67]. Indeed, multiple themes, such as decarbonisation, economic growth and social justice, are increasingly appearing in infrastructural transitions [44,68]. The question is to what degree a focus on dilemmas can help to better understand these attempts at more integral strategy-making [69]. According to Smith and Lewis [16], actors have a tendency to frame tensions as an either/or choice, when they could be more fruitfully approached from a both/and perspective. We observed this tendency in the trade-off between financial costs and broader societal goals (see "the principle price" dilemma). Still, De Bruijn, Ten Heuvelhof and In 't Veld [37] make the case for "dilemma sharing", framing conflicts between actors as dilemmas, as a basis for conflict resolution by forcing actors to consider trade-offs between both views. This raises questions on multi-actor intentionality [25].

5.3. Infrastructure Development Across Organizational Boundaries

Infrastructural transitions are highly contextual, nonlinear processes, subject to twists and turns [21]. While research shows the need for the integration of energy systems [41], the tensions between actors are often underestimated [25]. Indeed, the actors are faced with challenges very different from the past [43,70]. The results of this study show that the organizational boundaries of many actors were challenged by the coordination of regional heat infrastructure development. The dilemmas exceeded the boundaries of the heat domain and comprised the wider energy system instead (e.g., "integral parts" and "coursing consensus" dilemmas). This cross-sectoral perspective is not unique to the heat domain [44]. Examples include infrastructural transitions on water, food and mobility [10,41,71]. Therefore, we expect that a better understanding of tensions between actors is relevant for a variety of interorganizational strategy processes. The increased presence and polarization of viewpoints is becoming more common, where solutions are dictated not by technical performance measures but instead by "acceptable enough" to all actors [70]. Even in a relatively short timespan, a wide range of tensions came to the surface in the strategy process of the RES R-TH. This indicates that there are many more twists and turns in the coordination of infrastructure development than is often assumed. We believe that a more granular view of dilemmas is important to understand the topic of study and bring the disinterest and conflicts between actors into focus.

The categories of dilemmas can also enrich discussions on how to navigate underlying tensions. For instance, dilemmas centred around input offer several focus areas for the sustainable development of infrastructure and its practical implementation. For example, [72] identified various roles that the state can play across different modes of governance, including initiator, facilitator, promoter and gatekeeper. They also show that the state may assume multiple roles simultaneously, which can create tensions between actors and lead to patterns that either support or hinder change. However, there is a general tendency in the literature to overlook the dilemmas involved in performing transformative roles within complex contexts [73]. The "ruling of roles" dilemma addresses this gap, suggesting that change may often follow an iterative, meandering path.

6. Conclusions

This paper set out with the following research question: "What dilemmas can be identified during an interorganizational strategy process on the sustainable development of infrastructure?". We noted that the attention on interorganizational strategy remained limited and wanted to better understand the implications of interorganizational dynamics. To generate a better understanding of the decision-making challenges of interorganizational strategizing, we focused on tensions to take stock off the conflicts and uncertainties that organizations involved in them encounter. To provide our exploratory study with a rich, empirical context, we turned to strategy on the development of sustainable infrastructure.

The RES R-TH case presented a truly multi-actor environment in which many local and regional organizations were involved. While there was an explicit focus on joint strategy, the question remained how all the different activities would coalesce. We identified a variety of dilemmas that illustrated a broad range of tensions. The focus on dilemmas put the implications of joint strategy into perspective. Rather than indicating a list of problems that need to be solved, the dilemmas highlight significant decision-making challenges that need to be navigated. A key take from the results of the case study is that different types of dilemmas can (re-)emerge, even simultaneously, thus contributing to the notoriously complex and unpredictable nature of multi-actor strategizing processes. This means that linear approaches to joint strategy for example would have to develop the means and capability to effectively deal with the iterative nature of such processes. Finally, the RES-TH case study revealed the relevance of joint strategy for the development of sustainable infrastructure development.

Limitations of the study pertain to the boundary specification of the strategy process and the evaluation of openness in open strategy. Strategy can be divergent, fragmented

and chaotic [72]. Throughout the course of the research, it proved important to specify and empirically bound the interorganizational strategy process [73]. Without an iterative assessment of what the empirical boundaries are (i.e., what is being collaborated on and what is not), the concept of a strategy process remains elusive. By applying data triangulation, we were able to verify our interpretations on the structured and more informal elements of decision-making. However, despite these guidelines, it proved challenging to operationalize openness. A clear-cut way to isolate, delineate, observe and evaluate openness is lacking in the scientific literature. Instead, the openness (or lack thereof) afforded to regional actors was interpreted through the identified input dilemmas. The main critique of this approach is that openness becomes a "non-performative" factor [29]. However, learning from dilemmas requires attention to the contextual nature of strategy processes. Furthermore, this study understands openness neither as a desirable goal to be reached, nor as the positive opposite of closure.

For future research, we suggest that studies focus on the dynamic interplay between organizations and strategy. We propose the domain of infrastructure as a rich avenue to further study the phenomenon of open strategy. While the dilemmas we identified were manifestations of difficult one-off choices, they also illustrate the endemic tensions of strategizing across organizational boundaries. Therefore, the focus on dilemmas is put forward as a crucial avenue to generate a better understanding of underlaying decision-making challenges, since the infrastructural domain is riddled with processes, filled with interdependencies and loaded with values [74].

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