

Governing through visions

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Dignum, Marloes; Correljé, Aad; Groenleer, Martijn; Scholten, Daniel

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Original research article

Governing through visions: Evaluating the performativity of the European gas target models

Marloes Dignum^{a,*}, Aad Correljé^a, Martijn Groenleer^b, Daniel Scholten^a

^a Faculty of Technology, Policy and Management, Delft University of Technology, The Netherlands

^b Tilburg Law School & Tilburg School of Governance, Tilburg University, The Netherlands

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ABSTRACT

In 2010 an initiative was launched to realize a competitive single EU market for natural gas through the use of a future vision. This Gas Target Model (GTM) aimed to provide direction for concrete market development through regulatory structures as well as an overarching scope of what a functioning gas market would entail. This paper assesses the use and impact of such sectoral visions. We develop a framework that builds on the sociology of expectations and foresight studies and distinguish between the envisioning process, vision content, and vision use (output). The analysis follows the development of two versions of the GTM: 2011 and 2015. We find that the GTM has a contradictory nature. The vision that feeds into regulatory structures requires a stable and uniform rule set. The overarching vision requires incorporation of long-term uncertainty and adaptability. Moreover, the sectoral focus requires alignment to adjacent sectors and wider policy considerations. This makes it difficult to set boundaries, to identify relevant actors, and to ensure commitment from these actors. We conclude that the former vision was actively pursued and materialized in Framework Guidelines and Network Codes, while the latter vision is just being identified and framed.

1. Introduction—the European gas market and the gas target model

To facilitate the implementation of European Union (EU) directives and regulations aimed at establishing a well-functioning European market for natural gas, European regulators created a future vision in the form of the Gas Target Model (GTM) in the period 2010–11. An updated version was produced in 2015. In this paper, we analyze the performativity of the GTM visions as a relatively new policy instrument. Using evaluation criteria derived from the *sociology of expectations* and *foresight studies* we examine the envisioning process, the content of the visions, and the use of the visions in policymaking and implementation.

From the end of the 1990s onwards, European national natural gas markets have been subject to liberalization, (re)regulation, and unbundling. Institutional developments gained new momentum in 2009 with the Third Energy Package, which aimed to realize a well-integrated internal gas market by 2014. This package included stringent guidelines for ownership unbundling between gas trading and regulated

gas transmission activities, while requiring Member States to establish National Regulatory Authorities (NRA). To bring about EU-wide coordination, the Agency for the Cooperation of Energy Regulators (ACER) and the European Network of Transmission System Operators for Gas (ENTSOG) were founded.¹

By ordering mandatory organizational changes, the Third Energy Package set out a path for creating an internal gas market. However, it did not provide sufficiently detailed arrangements to facilitate uniform EU-wide implementation, leaving room for incompatibilities between Member States' institutions and market arrangements [1]. To create “a coherent framework from the various streams of policy under development by European energy regulators and the European Commission, with a view to implementing the Third Energy Package and establishing a functioning internal market” [2], 7, the Council of European Energy Regulators (CEER) initiated development of the *Gas Target Model* (GTM) at the 18th Madrid Forum in 2010² [4]. The GTM process was chaired by the regulators and developed in cooperation with the European Commission, system operators, and other stakeholders.³

* Corresponding author.

E-mail address: marloesdignum@gmail.com (M. Dignum).

¹ Transmission System Operators (TSOs) are responsible for the management, the operation and the development of the national gas pipeline systems in Europe.

² The Madrid Forum is an influential high-level forum consisting of the European Commission (EC), National regulatory authorities (NRA's), Member State governments, TSOs, gas suppliers and traders, network users, consumers, and gas exchanges. The forum aims “to provide an informal EU level framework for the discussion of issues and the exchange of experience concerning the establishment of a competitive internal market for natural gas” (Madrid Forum, 1999, Minutes first meeting, (see Madrid Forum archive)).

³ Both GTM 2011 and 2015 were created with rounds of stakeholder involvement, (publicly accessible) workshops, and discussion.

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The GTM sets out the following vision of the European gas market:

“[R]egulators see a competitive European gas market as a combination of entry-exit zones with virtual hubs. Their vision suggests that the development of competition should be based on the development of liquid hubs across Europe at which gas can be traded (these may be national or cross-border). Market integration should be served by efficient use of infrastructures, allowing market players to freely ship gas between market areas and respond to price signals to help gas flowing to where it is valued most. The target model has to allow for sufficient and efficient levels of infrastructure investment, in particular where physical congestions hinder market integration” [4], 5 and [2], 8

The GTM, as a vision, aimed to provide an overarching “big picture” of what a functioning gas market in Europe should be, while also guiding the harmonization and integration of the national markets and transport systems via detailed regulation, formalized in so-called Framework Guidelines (FGs) and Network Codes (NCs), to be implemented uniformly [5]. FGs and NCs form the most detailed level of the regulatory framework for the European gas market, covering aspects such as tariff structures, capacity management, network connections, and third party access. The overarching perspective and creation of the detailed NCs can be considered as two nested visions.

The creation of the GTM vision is interesting, as it appears to be a new type of policy instrument, alongside the EU directives and regulations that form part of the Third Energy Package. A similar approach has been applied in the European electricity sector, via the Florence Forum [6]. As a vision, the GTM aims to combine overarching and concrete policy goals, while also providing flexibility and adaption by means of (foreseen) updates. Moreover, it is attempted to seek maximum legitimation and cooperation for the concrete measures decided upon by involving a large circle of stakeholders in the creation of the GTM. Furthermore, the GTM involved the creation of measures and standards by which the achievements in the interconnected national markets could be assessed. As such, it could be argued that the GTM visionary process is a formalization and extension of the prevailing ‘layered’ style of EU energy policy-making, in which new regulatory layers (i.e. directives and regulations) are attached to existing institutions, at the national and European Commission level [7].

The use of future visions in policy-making is well established. A vision forms a social construct that can be used to guide contemporary developments towards a shared future. Visions align thought patterns, create cognitive possibility spaces, and allow the allocation of means [8,9,10,13]. These shaping characteristics of visions start in the envisioning phase and continue when the vision becomes accepted and is actively pursued [11]. This shaping property is called performativity [12,13,14]. A common way to use visions in policy-making is the *foresight* method, which aims to create a shared horizon for structural transformation [84]. Normative foresight implies an active engagement with the future and a prescriptive way of looking *into* the future [15,16]. The *sociology of expectations*, as a descriptive approach, analyzes the way in which visions become performative and consequently looks *at* the future [15,10]. We are interested in analyzing the development and use of the GTM as a vision. We argue that both perspectives on visions are important in evaluating the performativity of policy visions in sectors with high complexity.

Indeed, the energy sector is a highly complex. Development of the GTM involved a diversity of actors in the context of wider EU policy goals, particularly sustainability, affordability, and reliability [17,18]. Over the past 20 years a large body of literature has emerged on the development of the European gas market, focusing on the (lack of) integration [19], regulatory developments and governance [20,21,22,23], security of supply and dependency issues [24,25], the position of the European market in the global context [26,27], the Energy Union, and related topics. Yet, with few exceptions [5,28,1], there has been little attention for understanding the workings of the GTM as a policy instrument, and its effects. Those studies, however,

focused on the degree to which inherent criteria or policy objectives, like price convergence and market integration, have been achieved in the market. The GTM has not been analyzed as a multi-layered vision and policy instrument, so far.

This paper analyzes the GTM as a nested vision by using and combining evaluation criteria derived from the *sociology of expectations* and *foresight studies*. This enables us to examine (i) the envisioning process, (ii) the content of the vision, and (iii) the output, that is, use of the vision in policymaking and implementation. This provides insights regarding the performativity of the GTM and its development over time, as well as shedding light on the interactions between actors and their perspectives, contextual developments, and regulatory solutions.

The analysis is based on desk research of policy documents, including EU documents, the online archives of the Madrid Forum, GTM workshop presentations (and audio when available) of CEER and ACER, GTM reports (preliminary, intermediate, and final versions), public inputs, and discussions. For reflexive purposes, and to contextualize the documents and audio recordings, the desk research was complemented by six semi-structured expert interviews held from June 2014 to January 2015. These focused on the process of establishing and realizing the GTM. The vision analysis illuminates assumptions underlying the problem perceptions and the line of thought that led to the proposed solutions. The combination of actors, vision, and processes provides insights on the formation of a dominant vision and use of that vision in shaping regulatory developments, which is currently understudied [29].

Section 2 reviews the development of GTM 2011 and 2015. Section 3 introduces the concept of visions as a form of reflexive governance. It outlines the sociology of expectations and foresight studies and introduces the evaluation criteria of the analytical framework. Section 4 presents and discusses the results. Section 5 concludes.

2. Developing GTM 2011 and 2015

Development of the first GTM started in 2010. However, the need for a long-term vision for achieving a single competitive European gas market was expressed earlier, at the third European Gas Regulatory Forum on 26–27 October 2000. This forum is referred to as the Madrid Forum and formed a series of meetings among regulators, the industry, and stakeholders aimed at implementing the EU gas market directives in the Member States’ gas sectors. The 2010 initiative was preceded by a long history of failed attempts to have Member States comply with a series of voluntary guidelines. As stated in Forum proceedings, the guidelines were either not sufficiently clear and detailed, or they were considered outdated, or lacking in some other aspect.⁴

The 2009 Energy Package, with its 2014 deadline for a single EU gas market, and the mandatory establishment of transmission system operators (TSOs) in all Member States, gave new impetus to the development of a vision during the 18th meeting of the Madrid Forum, in the form of the GTM. This vision was expected to guide, on a voluntary basis, the development of a practical, step-by-step roadmap and to provide operational guidelines for good practice to ensure competitively priced, efficient, safe, and reliable provision of natural gas. Creating competition between suppliers by interconnecting market areas formed the core objective. It depended on the TSOs to create a transparent transmission system with non-discriminatory access, which should attract new entrants, thus enhancing competition.⁵

⁴ See Madrid Forum archive: <https://ec.europa.eu/energy/en/madrid-forum-previous-meetings>. Consulted 24 July 2017.

⁵ Derived from Madrid Forum archives: <https://ec.europa.eu/energy/en/madrid-forum-previous-meetings>. Consulted 24 July 2017. At the time of analysis consultation and preparatory documentation were available at the CEER website: https://www.ceer.eu/ceer_consult/closed_public_consultations/gas/gas_target_model.

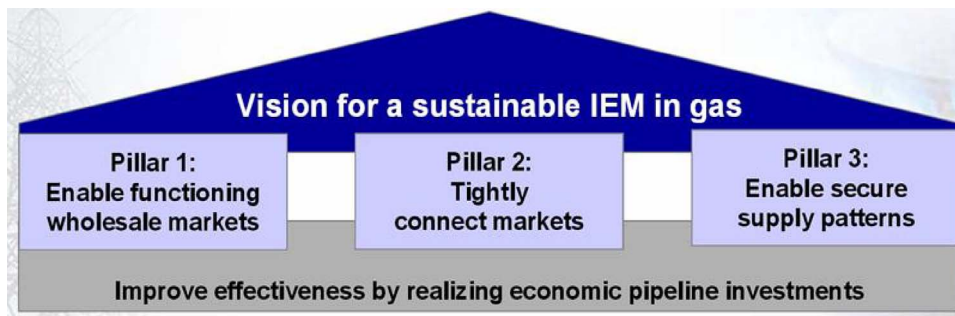


Fig. 1. CEER Gas Target Model.
Source: CEER [4], in adapted form see Glachant [5], 115.

2.1. Developing GTM 2011

The GTM was developed in a 10-month period starting in December 2010. CEER took the lead in the development process, organizing four stakeholder workshops, one academic workshop, bilateral discussions, a webinar, a public call for evidence, and a formal public consultation. The workshops were attended by some 700 participants [3], including a variety of actors in the energy sector (primarily gas but also electricity). TSOs, regulators, researchers, the European Commission, distribution system operators (DSOs), and producers were among those present.⁶

The options discussed at the workshops provided insight on positions regarding the further development of the GTM. Before the first workshop, CEER released a paper on the GTM and called for responses and viewpoints from a target audience [30]. Starting points for the GTM were that it should fit with the existing European legal framework and that it should support objectives like sustainability, security of supply, and efficiency. Three alternative GTM proposals were developed, presented, and discussed during the process; all with a different focus and emphasis [4,31,32,33].

A model suggested by the Netherlands' Clingendael International Energy Programme (CIEP) put priority on the ability to attract new supplies of gas, while recognizing that the market would remain oligopolistic, despite a likely increase of liquid natural gas (LNG) supplies [31]. This model accentuates evolutionary development of the gas market, instead of relying on a deliberate process of design. It incorporated contractual freedom and transactional flexibility of the market parties and minimal ex ante rules. It considered the EU market developments in the wider context of an emerging global gas market and in relation to other sources of energy. The model emphasized regional differences in supply options, as well as the need to create connections between these regions by economically justified infrastructure development.

A second model, by Sergio Ascari from the Florence School of Regulation (FSR), was the European American Model (EURAM), which took the competitive gas market in the USA as an example. Hence, it did not consider the transmission network necessarily as a natural monopoly [32]. By focusing on the creation and opening of transport capacity under explicit (re)tradable long-term contracts, and a harmonization of market rules for trading (instead of merging markets), EURAM sought to enhance competition by attracting new suppliers to the market.

A third model, the Market Enabling, Connecting and Securing Model (MECOS), was introduced by the FSR, which proposed tightly connected national wholesale markets that would align prices [34]. Whereas the EURAM model had supported third party access by allowing all players to contract under harmonized contracting conditions, MECOS proposed regulated access to the national transmission networks as entry/exit areas, to facilitate gas trading on such a virtual gas hub. Subsequently, these areas were to be connected and/or merged into one market with a sufficient size and trading volume to allow effective competition between a number of suppliers. At the 21st Madrid

Forum, MECOS was endorsed as the CEER GTM [35].

In addition to these differing models, Moselle [33], affiliated with LECG Corporation, provided scenarios for market developments under the GTM, which could be read as complementary to the CEER GTM. The three main scenarios were described as 'Framework Guidelines Driven', 'Merged Markets', and 'Coupled Markets'. These options differed in regulatory stability, problem assessment, and (desired) cross-border and market zone development. The model calls for further analysis and evidence-based decisions.

Already during the development process, the GTM, including the MECOS proposal, had been criticized from several sides as being overly ambitious and too rigid [36]. Consultant Frontier [37] warned against overregulation and excessive infrastructure investment. It modelled the consequences of enlarged trading regions, generating additional infrastructure costs, and the benefits to consumers. It posited free competition between different sources of gas not as a goal in itself, and called for case-by-case cost-benefit analyses and an eye for potential future (contextual) developments, as actors were deemed likely to position themselves in accordance with these expectations. Furthermore, the International Oil and Gas Producers Association noted the limited attention for the rapidly changing context of the economic crisis, policies, the uncertain future of gas, rising carbon prices, growth of renewable energy, the rigor of regulation, and the speed of implementation. Several parties urged a 'right balance' between long-term and short-term contracts.

The CEER GTM was presented at the Madrid Forum on December 1, 2011, and the MECOS approach was endorsed. From the start of the GTM process, it had been clear that the legal requirements of the Third Energy Package would form predefined boundaries for the eventual visionary scope. Therewith, the potential contribution from alternative models was reduced. The CEER GTM presented a vision for a 'sustainable Internal Energy Market (IEM) in gas' built upon three constitutive pillars (see Fig. 1).

The first pillar, sought to enable functioning wholesale markets throughout Europe by transparent entry-exit systems. Entry capacity of gas into a national transport system had to be allocated and paid for separately from the exit capacity, so as to facilitate the trading of gas volumes within the system, creating a 'virtual' hub. This system ensured that gas could be transported between entry and exit points (i.e. locations) within the trading regions without pre-establishing particular routing schemes.

The second pillar focused on connecting these wholesale markets by providing sufficient transmission capacity between the trading regions to the so-called shippers; the gas trading parties. To that end, cooperation between the European Commission, Member States, regulators, ACER and TSOs was to ensure the implementation of congestion management by 1 January 2014, at the latest. A platform where shippers could place bids for cross-border gas trades and implicit capacity allocation (crossing through multiple entry-exit zones) would facilitate this. Pilot projects, before early 2013, were to be completed to realize implicit capacity allocation.

The third pillar focused on ensuring long-term supply security, based on 'economic principles'. The liquid trading hubs were expected

⁶ Derived from workshop documentation.

to generate effective price signals, so that the upstream industry could enter into commitments and investments in gas production to supply the EU [4].

The three pillars, together, would safeguard gas trading over the shorter and longer term. Particularly long-term commitments were considered important for the development of capital intensive pipeline infrastructure, within as well as towards the EU. This international infrastructure was to be developed by market parties in cooperation with national regulators.

2.2. Developing GTM 2015

GTM 2011 was intended as a living document to be adapted to changing circumstances and developments. The participatory updating process started in 2013, and was guided by ACER instead of CEER. The difficulty to meet the 2014 deadline, gas and energy market developments, and changes in the contextual environment created a need to (re)shape GTM 2011 [38]. The new GTM was presented in January 2015.

The GTM updating process developed largely in parallel to the paper ‘Energy Regulation: A Bridge to 2025’ presented by CEER and ACER on 19 September 2014 [39,40]. The paper and GTM 2015 were complementary and explicitly interrelated. A preliminary version of the ‘Bridge to 2025’ paper, which referred to the target models for both gas and electricity, was extensively discussed during the GTM updating process [41,42]. The paper examined trends, developments, and contextual issues of influence and brought developments in these sectors together. On the supply side, it identified geopolitical developments as a threat for natural gas supplies and the possible supply of unconventional gasses. On the demand side, it addressed the decline in gas consumption and the uncertain future demand, while also referring to the increasing use of gas-fired power stations to quickly respond to fluctuations in the supply of renewable energy and the potential growth of gas in the transportation sector [39].

The ‘Bridge to 2025’ paper fostered further electricity and gas market integration. It also foresaw that coordination would move from the national level to a more centralized coordination, and highlighted the role of EU-level network organizations of TSOs, such as the European Network of Transmission System Operators for electricity and for gas (ENTSOE and ENTSOG), and of DSOs, data-hub operators, and retailers [39,40,43,44]. Moreover, it proposed measures for realizing a wholesale market in the EU by integrating neighboring markets into trading regions through mergers, thus creating larger balancing zones, or satellite markets attached to nearby spot and forwards markets [39,2]. The ‘Bridge to 2025’ served as input for GTM 2015.

Workshops for updating the GTM were held on: 8 October 2013,⁷ 19 March 2014 [43], and 15 May 2014 [44]. An additional academic workshop was held on 13 March 2014.⁸ Attending these workshops were actors including NRAs, TSOs, representatives of energy intensive industries, and gas suppliers and producers. It was observed that the requirements of the GTM had not been met. A main argument underscoring this observation was that price differences of natural gas in the several regions were higher than justified based on transportation cost, implying that there was no single European price [45]. Discussions focused on the empirical input that had been gained on the functioning of different areas of the European gas market and criteria for defining a functioning market (e.g., hub liquidity, market price development areas, entry-exit regimes and long and short-term gas markets, and retail and upstream competition). Also, contextual changes regarding gas uses now and in the future, and interrelations with electricity were

discussed at the workshops.

The updated GTM was presented on 16 January 2015. The updated model was built upon the same pillars as GTM 2011 (see Fig. 1). Similarly, it aimed for “a competitive European gas market, comprising entry-exit zones with liquid virtual trading points, where market integration is served by appropriate levels of infrastructure, which is utilised efficiently and enables gas to move freely between market areas to the locations where it is most highly valued by gas market participants” [2]. Yet, additional insights were incorporated, drawing on market developments and the empirical data collected starting in 2013. GTM 2015 incorporated developments such as a declining European gas demand, uncertainty of future demand, pressure on European gas-intensive industry due to US shale gas activities, increasing use of coal in Europe due to a low CO₂ emission allowance price, and the threat to the security of gas supply as a consequence of the Ukraine crises and the political tension between the EU and Russia.

We analyzed these developments, the consecutive GTMs, and the actions taken after the GTMs using a framework based on vision analysis. The next section presents the evaluation criteria.

3. Visions and governance

This section introduces general properties of visions and envisioning, in relation to the use of visions for reflexive governance. Based on insights from sociology of expectations and foresight studies, it extracts evaluation. Section 3.1 outlines some principles of visions and envisioning. Section 3.2 briefly outlines the two bodies of literatures. Section 3.3 identifies evaluation criteria related to the process, content, and outcomes of visions that are used for this research.

3.1. Principles of visions and envisioning

Visions can be defined as desirable future images [46] and play an important role in innovation and technology dynamics [10,14]. The performativity of visions implies that effort must be invested to create their shaping capabilities [13,10]. This means that visions are not a priori true or false. Their viability partly depends on the efforts that are allocated to the vision [47,48].

Performativity has its origin in the field of language [49], but it is also discussed in economics [50,51]. Traditional economic thinking is most closely related to the positivist epistemology, whereas performativity departs from the constructivist notion in which the world around us can be shaped and interpreted depending on the actor perspective. This constructivist worldview is actively present in policy, including in the use of visions.

Performativity ‘happens’ in each of the stages of the vision process in a different way. In the *process phase* thinking patterns become explicated and aligned towards the vision. In this stage, the vision is performative to those directly involved in the envisioning process. Once actors are aligned, and the vision is framed, the vision often becomes a public ‘document’. By its *content* the vision can become performative to a wider group of people. Once formulated, the reach of the vision is (potentially) larger, and when the vision is accepted a large-scale development may unfold. People can accept the vision and align their thinking and investment patterns accordingly. The third phase involves the results or *output*. The document itself provides insights into the envisioned end state and often also includes milestones and expected bottlenecks. These insights can shape developments through the allocation of means and thought patterns. Potentially, actual developments can be mapped against the envisioned state.

The expanding audience in the content and output phases, may also imply that new actors become involved. The broader perspectives, new, or updated insights can result in a discussion on the vision. The vision can be opened and updated, resulting in a new vision, in which more actors are aligned. A vision should not be perceived as an end goal, or an end product, it is an intermediary product as part of a large-scale and long-term process.

⁷ Documentation of the ACER workshop of the GTM can be found here: http://www.acer.europa.eu/Media/Events/Workshop_on_the_Gas_Target_Model-review_and_update/default.aspx. Consulted: 7 September 2017.

⁸ At the time of the analysis the workshop was online available, including agenda, presentations, preparations, responses and often audio recordings.

3.2. Conceptual strands of vision research

As stated, this research conceptually combines the notions of *analyzing* and *creating* visions. Both are strands of multidisciplinary scientific research. The first *analyzes* the structuration, the content, and the support of future visions, including temporal patterns regarding ambition, exposure, and decline over time [10]. It is a reflexive strand, focusing on whether and how visions become performative [85,86,13,14]. The second strand focuses on methods for envisioning. This field aims to look *into* the future, to explore and/or create direction [15,52]. This strand is output driven (rather than reflexive) and provides guidelines for creating a performative vision. For policy visions like the GTM, which aim to shape developments while being reflexive and analytical regarding the contemporary and future context, combining insights of both these strands appears beneficial.

The strand of *analyzing visions* has a strong origin in science, technology, and society (STS). It includes basic STS insights, such as the mutual shaping of the social and technological domains, an actor-oriented approach, and a constructivist perspective [10]. This type of analysis adds a helicopter view and identifies elements and dynamics on what makes a vision performative in a specific situation. Attention is paid to the structuration, content, and actor support of future visions [14]. Visions are seen as nested and can easily migrate between different policy and geographical layers [53]. This implies that performativity can also stretch over different layers. The scope and operationalization of the visions may differ in these layers [11]. A vision may be more or less encompassing, focusing on a technological artefact, an infrastructure, or society at large [12,13,11].

The dominant use of visions in policy is through the method of *foresight*. Foresight combines insights from economics, innovation studies, sociology, science, governance, and psychology [54]. It is a form of active future engagement in which formal articulations of possible futures are systematically created to support strategic decision making [55,14]. It is often shaped as a participatory process with selected, or all, relevant actors. Foresight may comprise predictive, explorative, and normative foresight methods (Van der Duin, 2014). As this research focuses on visions that purposefully aim to shape development, the focus is on the normative strand of foresight.

Normative foresight aims to provide probable and desirable paths of future development. It offers orientation points and guidance for the present [56,57], which can be used for policy and decision making [55,54]. An important insight from foresight is the distinction between project-oriented results (e.g., priority setting, strategy reports, informative websites, and educational systems) and process-oriented results (e.g., network-building, inviting new actors to the debate, and forming alliances) [56]. The Da Costa framework combines these insights and will be primarily used for this research [54].

3.3. Criteria definition for performativity of process, content, and output

When looking at the use of visions in the case of complex, multi-layered governance issues within a variety of contexts, such as in the GTM, the aim is to actively shape developments in a reflexive way. Visions can help align the different perspectives, as they are able to migrate between different levels and geographies. Drawing on the sociology of expectations, and foresight, this section identifies a set of evaluation criteria for sectoral policy visions, such as the GTM. Distinctions are made between process, content, and output criteria.

3.3.1. Process criteria

First is *diversity of actor involvement*. Envisioning is mostly seen as a collective exercise in which diversity enhances perspectives, enriches viewpoints, (re)defines directionality, and facilitates robustness of the vision [58,59]. The relevant actors depend on the definition of the problem and the solution and can therefore be dynamic.

Second is *problem handling*, which encompasses contextualization, problem definition, and problem solving. A vision has a certain scope

and context in which the envisioned state would bring about improvements [60]. It also includes prioritization. In its framing, certain issues are highlighted while others are left aside [11]. Consequently, problem handling involves normativity. Addressing this normativity fosters reflexivity to the vision. Comparisons to other visions and to problem definitions and solutions can provide insights on different dimensions of the issue [61].

Thirdly, visions *legitimize agendas and the allocation of resources*. Visions provide a point of orientation and can funnel resources towards this orientation. This can also work restrictively, creating lock-in and limiting the creation of new possibility space [10,9]. The allocation of resources is an indicator of performativity. The potential creation of lock-in through the performativity of an aligned vision is a reflexive indicator.

Fourth is the *time span and tangibility*. A realistic time span is highly dependent on the scope and the allocation of resources. Identification of milestones makes the vision more tangible [61]. The accompanying time span indicates the ambition, the sense of urgency, and acceptance of the vision [62].

Fifth is *congruence and interpretive flexibility*. When actors work towards realization of a vision, this does not mean that there is complete agreement; a vision often entails a degree of multi-interpretability. This interpretive flexibility can help in creating action and can work constructively for the creation of policy coalitions [87]. Interpretive flexibility also allows modulation and enhances flexibility [58]. However, too much interpretive flexibility renders the vision hollow, preventing meaningful interventions [58,53]. For layered interaction, communication and adjustments between neighboring layers and sectors is instrumental.

Sixth is *creativity and dynamism*, a vision opens patterns of thinking and closes them when the vision materializes into content. The vision itself is not the end stage, but needs adaptation in accordance with changing circumstances and new (technological) developments and expectations. This updating process, including the iteration of opening and closing of thinking patterns, keeps the vision topical and reflexive to contemporary developments.

3.3.2. Content criteria

The outcomes of the envisioning process include network formation (e.g. enhancement, elaboration, and/or strengthening of a relevant network). The vision often materializes in a public image or a document that can become performative beyond the group of people involved in the envisioning process. For the likelihood of this performativity to occur, five content criteria for the quality of the vision are introduced.

First, *visionary inspiration* stretches beyond what is considered (easily) feasible [63,64,65,46]. The vision outlines possibility space, communicates a sense of urgency, stretches the realm of possibility, and urges actors to work towards a reality that may not develop otherwise [58,62,66,67].

Second, a vision should be *systemic and coherent*, implying that the vision is rooted in everyday life, including all relevant actor perspectives, public values, technological expectations, practices, and social arrangements, as well as their interactions and interdependencies [68,46].

Third, the *embedding* of a vision in the relevant spaces needs to be accommodated. Visions can migrate between different layers and be mobilized in these different contextual environments (e.g., local, regional, national, and transnational) [9,53].

Fourth, visions are reflexive to contemporary society by presenting an alternative and, in some aspects, better future⁹ [58,63,15]. This reflexivity helps avoid the risk of reinforcing existing pathways [88,14]. Visions help to identify the core values that are threatened in

⁹ Dystopian futures have the same reflexive properties by presenting a future that is undesirable on some aspects, urging to change the present to avoid dystopian consequences.

contemporary society. As a consequence of this normative focus, they can also become political and subject to strategic behavior by interested parties [69,70].

Fifth, a vision provides a stable reference framework for target setting and monitoring. Achievements are linked to the allocation of resources, such as time, money, staffing and events [48,46].

3.3.3. Output criteria

The output criteria rely heavily on insights from normative foresight, as analytical approaches do not prescribe desired outcomes.

First, *informing policy*. Visions create input for policymaking, for example, by identifying risks, trends, opportunities, strengths, weaknesses, and challenges [54]. Input also includes agenda setting and involvement of policymakers in the envisioning process. Effective policy advice further depends on the possibility space feasible within the current government constellation. Timing and focus are important as well.

Second is the *facilitation of policy definition and implementation* through the outcome of the envisioning process. This implies that outputs such as vision reports, roadmaps, scenarios, presentations, and hearings should be used for policymaking. This can be done reflexively (e.g., through incorporation of identified risks or anticipation of identified challenges) and/or prescriptively (work towards the described future). Either way, the level of detail should be sufficient to enable translation of the vision documents into concrete action. Therefore, this criterion is more concrete than the informing of policy that is mentioned as the first output criterion. This variable is content related, regarding the tangibility, prioritization, and monitoring capabilities of a vision.

Third is the *embedding of participation* in policy implementation, creating transparency and legitimacy [54]. As foresight should involve all relevant stakeholders, this principle is core to participatory foresight exercises. A point of attention here is the difficulty of identifying all relevant participants in an evolving context, that requires adjustment of focus, and potentially level of detail.

Fourth is the *reconfiguration* of the policy system to enhance robustness to long-term challenges [54]. Corresponding to policy theory, this can take the form of incremental changes which together facilitate structural change [71,72]. More radical measures are also possible, but unlikely in an existing and relatively stable policy framework.

Fifth is the *symbolic function*. Da Costa defines this as “[an indication] to the public that policy is based on rational information” (2008, 369). This description follows the presupposition that such a thing as rational information exists and can be fed top-down to the public. This surpasses the framing of visions that (discursively) highlights or prioritizes certain aspects, while rendering other aspects opaque [11]. Additionally, the divide between rational information and emotion is often used to position the public’s opinion as unimportant [73]. It also narrows the interpretation of the participatory output variable in which *all* relevant actors are required to have a place. Despite these objections, the symbolic function is maintained as an output variable. In the operationalization, it is interpreted as the legitimation process to a broader audience.

These criteria are used to analyze the GTM. The next section presents and discusses this analysis.

4. Analysis and discussion

This section analyses GTM 2011 and GTM 2015 as a vision using the framework presented in Section 3. Section 4.1 analyses the GTM 2011 and section 4.2 analyses the GTM 2015. Section 4.3 compares the analyses, aggregating the findings. Section 4.4 discusses the results and places them in a broader context.

4.1. Analysis of GTM 2011 as a vision

Table 1 presents the main observations regarding GTM 2011 as a vision. The Third Energy package provided both the boundaries and the focus for this vision.

4.2. Analysis of GTM 2015 as a vision

Compared to GTM 2011, the 2015 vision was not only broader, but also more explicit regarding criteria for evaluating and realizing a single market for gas. It provided additional contextualization concerning global and European gas trends and geopolitical developments. The inclusion of potential demand growth areas was also new. GTM 2015 embraced the policy framework of the ‘Bridge to 2025’ paper, but the longer and higher level policy framework was the European Energy Union, which was under development at the time. As the role of natural gas was relatively undeveloped in the Union, the GTM vision remained vague and arbitrary in terms of substantial objectives and a future perspective for the gas industry. Table 2 provides the main observations of the analysis of GTM 2015.

4.3. Interpretation

Initial steps for the creation of a single European gas market were built on voluntary guidelines. The performativity of these guidelines was limited, as they incorporated too much interpretive flexibility; they were too imprecise to shape a uniform implementation. So, most Member States, NRAs, and TSOs were unable, and often unwilling, to cooperate. Only in a few countries, like the UK and the Netherlands, did functioning gas markets evolve (see Parmigiani [89]).

The 2009 Third Energy Package abandoned voluntariness and set the 2014 deadline for completion of a single EU market. Yet, the provisions of the Third Package also incorporated too much interpretive flexibility. So, a number of regulators under the aegis of CEER, and facilitated by the Florence School of Regulation, started the GTM 2011 process, aiming to create a vision with a higher degree of coherence and direction. In this section we compare the evolution in the process, content, and output of GTM 2011 and the update in 2015, and assess their performativity.

Regarding the *process*, it can be observed that the primary actors did not change substantially. The first GTM was chaired by CEER and the second one by ACER, both representing the European NRAs. The same individuals played key roles, and there was diverse and substantial involvement of stakeholders from the gas sector. The Florence School of regulation was more heavily involved in GTM 2011. Apart from some representatives from the power sector and large industry, there was little interest outside of this group. This minimal external involvement may be understandable, due to the complexity of this issue [57,17]. Moreover, matters like security of supply, sustainability, and the potential roles of ‘other gasses’ were dealt with in other fora. Particularly in GTM 2011 there is scant attention for trends and the consequences of crises and irregularities.

This, undoubtedly, had an impact on the *problem handling*. Both GTMs defined the absence of a functioning gas market as the main problem. This was to be solved by creating regulatory institutions that would induce such a market in accordance with European gas and electricity directives. So, both GTMs combined a prescriptive focus and voluntary acceptance as input for the shaping of such regulations. For the second GTM empirical data was more widely available and it incorporated more contextual insights, trends, and even suggestions for stimulating future uses of natural gas, like in the transport sector. Nevertheless, due to its strong reliance on a regulatory approach, the GTMs could only address EU internal arrangements. Main (potential) sources of gas supply thus remained out of the picture.

Regarding *time span and tangibility*, GTM called for a long-term vision for the EU gas market. Yet, the deadline for its realization was set

Table 1
Observations with respect to GTM 2011.

Process		
1	Actor involvement	A 10-month participatory process chaired by CEER, with active involvement of many actors associated with the gas sector, including TSOs, producers, regulators, consultants, and a number of think tanks such as FSR, CIEP, LECC, and IFRI. There was some policy-level involvement, but no further involvement beyond those directly involved in regulating the sector.
2	Problem handling, definition and solving	The GTM and the single European gas market aimed to benefit customers by creating a ‘well-functioning’ gas market through unbundling trade and transport, spurring competition, providing simple access to transport, and enabling gas to flow where it is valued most, thus enhancing (consumer) welfare.
3	Legitimization	Externally by the requirements of the Third Energy Package, Madrid Forum. Internally by the participation and recognition by actors in the gas sector.
4	Time span and tangibility	After a decade of unsuccessful voluntary guidelines, a short time span of three years was foreseen, driven by the mandatory overarching scope of the Third Energy Package.
5	Congruence and interpretive flexibility	Aimed to reduce the interpretive flexibility of the Third Energy Package by increasing its congruence. The GTM was to enable a more coherent formulation and implementation of FGs and NCs. However, little congruence was reached, as multiple GTMs emerged. GTM guidelines remained fairly general.
6	Creativity and dynamism	The GTM was positioned as a living document. The GTM was aimed to be updated after implementation of the first four NCs on capacity allocation mechanisms, gas balancing, harmonized transmission tariffs, and gas interoperability, in 2013.
Content		
1	Visionary	The vision focused on implementing the 2009 Third Energy Package, founded on the EU policy framework and existing regulations. The notion of connecting well-functioning markets was essentially driven by neoclassical welfare economics and natural monopoly regulation.
2	Systemic and coherent	Boundaries of the GTM were placed around the European Union. The nature of the supply side of natural gas was left out of consideration. It was assumed that a ‘well-functioning’ European market would attract sufficient gas from EU external producers to cover demand. There was limited attention for social trends, like the reduction of CO ₂ emissions.
	Embedding	Chaired by CEER, in cooperation with a wide variety of stakeholders from the gas sector, involvement of the European Commission, and some national governments.
4	Reflection	Focus is on the Third Energy Package. Trends, contextual factors, potential future substitutes and alternative market conceptions were not taken into consideration. Despite the focus on consumers’ welfare, there was no attention to what this may imply. For example, the CIEP GTM addressed the possibilities of high prices and volatility as a consequence of market developments [31]. This could deprive some countries or groups of consumers from using gas in basic energy functions.
5	Monitoring and target setting	General guidelines serve the implementation of FGs and NCs. More empirical insights on the functioning of the market were expected and collected to inform more detailed guidelines.
Output		
1	Informing policy	By means of voluntary guidelines and mutual exchange of information the national regulatory agencies and the TSOs were addressed to implement the GTM. Connecting national markets particularly concerned the community of CEER, ACER, and ENTSOG.
2	Facilitating policy implementation	The GTM aimed to facilitate the realization of a European energy market by 2014. It would further the creation of new, homogeneous, regulatory layers and institutional structures, establishing a European playing field in the gas market.
3	Embedding of participation in policy implementation	The GTM was to assist the implementation of the Third Energy Package and serve as a guiding vision for formulating the NCs. It also opened the possibility for the regulators to deliberate in a large group of actors about the conceptualization of the EU gas market.
4	Reconfiguration of policy	Tuned towards the implementation of the Third Energy Package, aiming to shape FGs and NCs, that would enable a functioning European gas market.
5	Symbolic function	Highly relevant. Awareness and discussion arose among the main actors in the gas industry. Involvement from the community was high.

at the near term, due to it being set externally by EU policy objectives. GTM 2015 focused on a larger time span and was, arguably, more realistic in its focus. Apparently, it is difficult to achieve sufficient detail and cohesion in the identification of criteria and their interpretation and operationalization in regulatory codes. This problem arose with the voluntary guidelines that preceded the Third Package, with the Third Package itself, and with GTM 2011. An obvious reason for this is the great variation in the structural circumstances in which the many different national gas markets in the EU operate, which makes it hard to adhere to one overarching vision. GTM 2015 is more detailed, but also more flexible in the sense that it leaves possibilities open for decisions to match regional circumstances.

The creation of the GTM found its *legitimation* in the EU Third Energy Package and in the objectives of the organizations of the Madrid Forum (like the regulators in CEER and ACER, TSOs in ENTSOG, and market facilitators, such as exchanges and gas intelligence consultancies). As regards the gas industry, the standpoints of traders, and retail companies vis-a-vis their interests regarding the content of the GTM varied strongly, depending on their positions in the market.

With respect to the *congruence* of the vision, while the problems and

the solutions were similar in GTM 2011 and GTM 2015, the boundary setting was different. GTM 2015 reached out, increasing its embedding through enhanced detail regarding NCs, regionalization, and links to wider policy domains and trends (e.g., global gas market trends and security of supply) and adjacent sectors (electricity).

The degree to which the GTMs were *creative and dynamic* shifted somewhat. GTM 2011 was relatively static in its solutions and recommendations. Development of GTM 2015 was sensitive to changing contextual circumstances and the scope was broadened. Nevertheless, both GTMs began from the same starting principles, encompassed in the Third Energy Package. This restricted the creativity allowed in the visions. Both GTMs aimed to provide a stable framework in which the actors could operate and make long-term investments and operational and strategic decisions.

Regarding the *content* of both GTMs, it can be observed that the participatory procedures made the GTM more widely shared. However, the GTM 2011 process resulted in several diverging proposals with diverse *visionary* perspectives that were not included in GTM 2011. Interestingly, some of the issues rejected in the first round, like the external supply of gas and the shifting market circumstances, were

Table 2
Observations with respect to GTM 2015.

Process		
1	Actor involvement	A participatory process, chaired by ACER. Active involvement of actors in the gas sector and policy. Much of the criticism of GTM 2011 was addressed in this GTM, making this vision document more widely shared.
2	Problem handling, definition and solving	The problem definition is comparable to GTM 2011 but includes a broader contextualization including gas market trends. More regional solutions were suggested.
3	Legitimization	External: Embedded in the 'Bridge to 2025' paper, supported by the Madrid Forum. However, it is less embedded in broader energy policy since the deadline of the Third Energy Package had already passed. Internal: it was linked to ACER and CEER ambitions and had ample stakeholder involvement.
4	Time span and tangibility	The coming decade up to 2025, including long-term trends. It combines trends with detailed insights. Between GTM 2011 and GTM 2015, additional information on the functioning of EU gas markets was obtained, including indicators such as trading, liquid spot, forward and/or futures market, and metrics to assess the interconnection of markets. GTM 2015 incorporated this empirical information in its future vision. This was one step further towards integration than arranged in the NCs of the Capacity Allocation Mechanism (CAM) and Congestion Management Procedures (CMP).
5	Congruence and interpretive flexibility	GTM 2015 is further detailed. In line with the 'Bridge to 2025' paper, GTM 2015 acknowledges the increasing interrelatedness between gas and electricity and the corresponding changing roles of market actors including TSOs.
6	Creativity and dynamism	Context, actor involvement and problem definition were updated and expanded. Solutions were sought in the same direction within current regulatory frameworks.
Content		
1	Visionary	More overarching focus responsive to market developments (e.g., the Ukraine-Russia 2015 gas crisis and declining gas demand in the EU), and forward looking in respect to potential new future uses (e.g., gas-fired power plants as backup power to mediate fluctuations in renewable energy supply with a lower load factor than before. Cooperation between gas and electricity TSOs was considered essential for optimizing this interrelation).
2	Systemic and coherent	System boundaries drawn larger. It was also recognized that most Central and Eastern European countries did not meet the GTM requirements, whereas those in North-West Europe were much closer to passing the test. Market-based measures were expected to improve supply security, such as dynamic imbalance pricing without a price cap during an emergency, unbundling of storage, appropriate network tariffs for users, and incentives for TSOs to work together. Both GTMs included detailed guidelines for creating such measures, supported by additional market insights, and an overarching perspective of a EU gas market. Security of supply was sought in more diversified supply pattern.
	Embedding	Contextual developments express uncertainty experienced by the gas sector. From within this constitution of actors, there was a search for the boundaries of the vision. Self-evaluation of GTM metrics of market integration is demanded from Member States every three years from 2017 onwards [74].
4	Reflection	The overarching focus and inclusion of (potential) trends and geopolitical developments in the problem perception allowed for wider reflection on the direction of gas market developments, also in relation to policy. The GTM added new supply chain developments, like the use of natural gas in transportation, power to gas to store electricity as hydrogen or synthetic gas, and small-scale uses of LNG and CNG. The scope surpassed the Third Energy Package, but solutions remained tuned to neoclassical economic thinking. For security of supply, interestingly, alongside the GTM a different instrument was created. In early 2015, the Commission announced a new security of supply regulation which stated that, as a final resort, market mechanisms could be abandoned. A solidarity principle, in which neighboring states would help each other to ensure essential gas supplies, was to be in place [75].
5	Monitoring and target setting	Incorporation of much more quantitative data and insights on the European gas market that were unavailable during the GTM 2011 process. The founding of GTM 2011 also helped create a sense of urgency for gathering this data. This was used as input and support for GTM 2015.
Output		
1	Informing policy	ACER took the lead in the process. The European Commission was involved and informed regarding the development of the GTM. Additional detailed and specialized data on gas market development was collected that informed policy.
2	Facilitating policy implementation	GTM 2015 aimed in part to facilitate the formulation and implementation of NCs. It could serve as a framework for ensuring that the NCs are well aligned. However, it is unclear to what extent the GTM is used in this way.
3	Embedding of participation in policy implementation	The GTM became recognized in policy documents. The vision provides insight on the line of thinking of the gas sector and the direction this sector is taking for market development.
4	Reconfiguration of policy	The document formed a vision from the sector for larger EU gas policy and can be seen as a call for resonance from beyond the sector to wider policymaking. There is a link to the sectoral policy presented in the 'Bridge to 2025' paper. However, explicit relations to wider policy, such as the Energy Union, have not (yet) emerged.
5	Symbolic function	Creation of more consensus by incorporating criticism. The inclusion of geopolitical and contextual issues potentially urges the creation of a more overarching policy vision.

incorporated in GTM 2015. The embedment of the GTM within the framework of EU gas sector regulation has reduced the visionary leeway for such a market model.

Both GTMs can be defined as *systemic and coherent*, applying consistent approaches to the trading of gas in markets as well as the natural monopoly regulation of the transmission networks and other facilities. Yet, differences in scope are clearly visible. The more overarching GTM 2015 also aimed to look past the implications of the Third Package. This vision was built on current trends. After the 2009 Third package, there was no new large policy framework or vision that incorporated gas on which the GTM vision could be built. Therefore, the overarching framework of the GTM was created by the regulators.

The GTM put the perspective of the regulator(s) central in

evaluating the activities of both the TSOs as well as the trading parties. Currently, the main focus of gas sector regulation is economic values. Essentially, efficiency is to be achieved either by competition or by stringent regulation. By and large, other values are considered exogenous to the regulators' perspective. Hence, *reflexivity* should be tuned towards the evolution of the gas sector, on the one hand, and towards developments in national and EU energy policy on the other. The reflexivity of regulators could be enhanced by opening the boundaries of their system analysis. This particularly involves social values, like the reduced public acceptance of fossil fuels including gas, integration of gas and power, and security of supply, which is now addressed in separate regulations.

With respect to *monitoring and target setting*, the GTM aimed to

facilitate the shaping of coherent network codes to increase tangibility. The GTM itself is not detailed enough to use directly for monitoring and target setting. GTM 2015 introduces guidelines for self-assessment of regions [76].

In terms of vision output it can be argued that *informing policy* has been successful. The GTM processes made the discussion more inclusive, incorporating the European Commission as well as nation-states and the electricity and gas sector (Madrid, Florence, and Ljubljana). There is value in initiating such a widely shared participatory process with relevant stakeholders to shape such important policies. The GTM is also referred to in other policy documents emerging from the Brussels institutions and by other parties in the energy and gas sector.

Regarding its role in *facilitating policy implementation* there still seems to exist a discrepancy between on one hand the problem perception and prevailing solutions in the GTM and, on the other hand, the much broader palette of issues at stake in the various gas sectors in the different regions in Europe. It remains to be seen whether the goals of the Third Energy Package and the GTM will be met everywhere in Europe. Interestingly, the Energy Union initiative provides the next overarching ambition to work towards, but it is very thin on natural gas.

The complexity of the issue also dictated expert involvement, which was amply present. However, the complexity limited communication possibilities with a wider audience and hampered involvement of the political domain. In that sense, it seems difficult to *embed broader participation* in policymaking, or regulation, on issues like the GTM.

The GTMs are recognized in policy documents. With respect to *supporting policy definition*, the extent to which the GTM is actually used in shaping NCs and regulations is difficult to assess. For GTM 2011, the time span after the completion of the envisioning process and the envisioned realization date was very short. Yet, such shaping possibilities could also emerge at a later stage.

The Third Energy Package *reconfigured the policy system*, or landscape, of the EU gas market with the founding or formalization of the roles of different agencies, such as ACER and ENTSOG. In the participatory process of the GTM all actors, including new ones, came together for discussion and input. Moreover, all kinds of representative organizations have emerged around particular activities in the gas value chain. Platforms like the GTM community can help in arranging the new institutional landscape. Indeed, GTM 2015 issued a call for (re)defining roles and responsibilities among actors, particularly in light of the inclusion of new issues and trends that may require new policy and different ways of regulation. This (re)defining of roles can be seen as an operationalization of the reconfiguration of the policy system.

Possibly the main *symbolic function* of the GTM process has been to raise awareness for the position of the EU gas industry and the role of gas in energy supply, in the context of European energy and competition policy. The GTM also created support for collecting data to gain additional insight into gas market functioning and development.

4.4. Discussion

The objective of the GTM was to develop a guiding vision for a functioning European gas market. The GTM served multiple purposes. On the one hand, it aimed to be sufficiently concrete to ensure uniform implementation of the Third Energy Package and, consequently, the creation of a functioning single European gas market. On the other hand, it was positioned as a long-term vision for the European natural gas market (implied beyond 2014). This twofold focus of developing a sectoral vision for a (regulatory) market that is inherently interwoven with other markets and broader contextual developments (European energy policy and the positioning of local actors, specifically TSOs and NRA's) was analyzed in this paper, utilizing the process, content, outcome framework. Let us now discuss some observations on the use and impact of the GTM in shaping an integrated European natural gas market.

4.4.1. The objectives of the GTM have a contradictory nature

There are active efforts to establish both a *concrete vision* (for aspects such as cross-border trade and market development) and an *overarching vision* (of a long-term European gas market). The endeavor has a contradictory nature. The first vision requires a stable and uniform rule set for the stability of market actors; it is inspired by a strict regulatory approach in which numerical criteria and measurability, reporting and enforcement often play a main role. The second vision requires incorporation of long-term insecurities regarding future demand and requires flexibility to adjust accordingly. The visions hence harbor an inherent tension between stability and flexibility. For example, detailed formal rules such as NCs create stability and certainty for the actors involved. Such stability is beneficial in a sector that requires long-term commitment of the actors and amounts of sunk investments, especially when it concerns development of physical infrastructure. At the same time, recent developments in the contextual aspects of the gas market, such as the Paris Agreement and the Energy Union have been volatile and highly fluctuating. This volatile environment creates tension with the regulatory stability required to allow actors to position themselves in the emergence of a single European market. A vision allows the incorporation of such changes that require flexibility and (rapid) responses. The remaining question is how to combine the need for flexibility and stability, i.e. economic and (geo)political changes and infrastructure development.

4.4.2. Difficulty in setting boundaries due to the nested character of the GTM

The sectoral focus of a vision requires alignment to adjacent sectors as well as to wider policy considerations. This makes it difficult to set boundaries. The current developments in the GTM originate from a gas sector regulator perspective. This has driven the boundaries, time span, and search heuristics (of both problem definition and solutions) of the GTM. Yet, the GTM and the European gas market in general do not exist in a vacuum. Electricity sector liberalization, climate policy, mobility, and EU foreign policy are all closely related. Developments in these sectors and the gas sector would ideally be closely coordinated. In addition, it is difficult to set vision boundaries in a volatile context. Regulatory decisions aim to create long-term stability and a predictable investment climate in which large (infrastructure) investment decisions can be taken. However, contextual developments regarding geopolitical changes (e.g., Brexit and the Crimea annexation), global warming, and acceptance and use of gas in Europe (e.g., the possible abandonment of natural gas in the transportation sector) impact policymaking and implementation. The question arises as to which developments are to be taken on board and at what stage. When does a global development become important enough to change European policy decisions? More fundamentally, how can potential global changes be anticipated when regulatory principle development must aim at forming a stable rule set?

Additionally, the general principles of the GTM and its fit within existing legal boundaries have not been discussed within the GTM. A broader perspective may shed new light on the gas market design. This could be sought under the current Quo Vadis initiative of the EU Commission¹⁰ with a study providing substantiated analysis of whether the current regulatory framework in the EU gas sector is the most effective to maximize overall EU welfare and whether amendments may be necessary. This would be a next step in the ongoing sequence of gas market restructuring, in an ever-changing energy and gas market (see Correljé [20]).

¹⁰ A collection of documentation on the Quo vadis gas market regulatory framework can be found at <https://ec.europa.eu/energy/en/studies/study-quo-vadis-gas-market-regulatory-framework>. Consulted: 7 September 2017.

4.4.3. Challenge of identifying relevant actors and ensuring their commitment

The twofold focus of the GTM and the difficulty of setting boundaries make it challenging to identify relevant actors and ensure commitment. One of the difficulties is the high degree of expert knowledge required to formulate specific regulatory guidelines. The energy domain is a particularly complex field for European governance. This limits the involvement of (groups of) actors, although alignment to the wider context requires a versatile actor group. Inclusion of more general policymakers next to largely sector-specific experts, however, is also problematic. It is questionable in how far actors with core specializations elsewhere would be interested in becoming engaged at a detailed level. Moreover, how legitimate would their involvement be, considering their linkages with other sectors and with different layers of policy?

4.4.4. The visions develop at varying speeds

The two nested visions of the GTM (the uniform implementation of the Third Package and the vision beyond 2014) have developed at varying speeds. The first type of vision has been actively pursued and materialized in FGs and NCs. The latter vision is just being identified and framed, and has fallen largely outside the realm of influence of the actors involved in the GTM. Consequently, concrete policy action beyond sectoral developments has largely been lacking. This distinction stems from the difference between the handling of EU internal procedural matters, over which EU actors have control, and international or contextual developments that are outside the scope and jurisdiction of the actors involved in the envisioning process.

Two additional notes are merited in this regard. First, regarding the first vision, the realization of the internal gas market shows great variation between regions. North-Western Europe is considerably closer to a well-functioning gas market, while countries elsewhere (Germany, Spain, Austria, and Italy) lag behind. Causes may be found in the number of suppliers, geographic location, ability or willingness to pay higher prices, political preferences (ideologies), and the complexity of adjusting assets and data systems to NCs. Second, GTM 2015 shows a growing awareness of contextual factors compared to the more EU internally oriented GTM 2011 and additional reflection regarding difficulties in incorporating GTM principles. For example, initially, expectations of LNG imports were (too) high, and the basic conditions for competition were neglected. Geopolitical developments are also relevant: e.g. it is questionable whether countries would be willing to invest in a gas market if there is essentially only one supplier (Russia) that can undercut LNG prices. Interestingly, the challenge is not stopping Russia from raising prices, as one would expect from a monopolist, but from lowering prices to keep competition out of the market. In the end, there is a risk that the overarching vision may move away from a single EU gas market while the NCs are being implemented.

5. Conclusion

This paper assessed the use and impact of the GTM visions in shaping an integrated European natural gas market. Specific attention was given to the use of the subsequent GTMs in furthering compliance with EU policy and the conditions that enhance its performativity. The paper derived criteria for evaluating the use of visions for governance by combining insights from the sociology of expectations and normative foresight studies. This was used to analyze the envisioning process, the content of the vision, and the use of the vision in policy (output). The framework proved useful in creating additional insights into the development and use of the GTM vision in European gas market development. It highlighted some (implicit) choices that were made in the three stages of vision performativity.

The GTM is an effort to align different levels of governance through visions. Our analysis of the development of the nested gas market regulation and the sectoral GTM development highlighted both the

utility of visions in sectoral development, as well as the difficulty in using them. First, the GTM has a contradictory nature. The concrete vision requires a stable and uniform rule set for the stability of market actors. The overarching vision requires incorporation of long-term (in) security and the flexibility to adjust accordingly. Second, the sectoral focus of a vision requires alignment to adjacent sectors as well as to wider policy considerations, making it difficult to set boundaries, to identify relevant actors, and to ensure commitment from these actors. Third, the concrete implementation of the vision has been actively pursued and materialized in FGs and NCs, although the overarching vision is just being identified and framed. These difficulties in assessing boundaries and development argue for increasing alignment between visions in different sectors and at different governmental levels and regions, creating a layered vision development. This would also allow for enhanced context-dependent development and fine-tuning of the vision [77].

Our analysis centered on the shaping capabilities of visions. Visions have the potential to serve as a means of communication and to create congruence between different layers of policymaking [53]. We identified the layered nature of policy (from general to highly specialized) and the sectoral focus as barriers to increased vision performativity. The overarching, larger vision can easily migrate to another layer of policymaking, because of its generic message. However, generally this principle also implies that information is lost in this communication. Additionally, the required specialized knowledge hampers dialogue with other levels of government and governance. To facilitate communication, it is necessary to have a more elaborate vision to support the more generic vision as well as intermediary actors who understand the interests, dilemmas, and difficulties of both levels. Otherwise, the consequences of regulatory demands and the impact on other sectors remain unclear.

The use of this framework also indicated that enhanced reflexivity in the development and content of the vision creates additional insights. Incorporation of such additional reflexivity in the three stages of vision performativity can help create increasingly robust visions. In the case of this complex sector, with rapidly changing global developments, this procedure could enhance flexibility in the envisioning process and help in anticipating global changes. For such signaling to be effectively anticipated in policy, the envisioning process of the European gas market would need to take place on a higher layer of political decision making. It is advisable to also include unlikely scenarios to obtain more robust visions, considering the speed of some high-impact events. This would imply that gas experts, as well as other (political) experts, should be committed and intensively involved. Reflexivity and adjustments between different policy layers will help to shape credible and robust visions that are aligned in between adjacent sectors and nested levels. This linking of different layers through visions can facilitate communication. The vision can serve as a communication platform and expose mismatches between the conceptual (and practical) operationalization and developments incorporated in different layers early in the process [78]. By creating overlapping transcending boundaries and focuses, visions can migrate through these layers, crossing traditional boundaries and layers.

This approach may be particularly useful for polycentric governance issues, which allow a sector to develop reflexively and strategically in accordance with global challenges and trends. Polycentric governance issues are characterized by embedded complexity at a horizontal and vertical geographical and institutional scales [17,18,79,83]. As visions have the capacity to travel through layers and spheres [53], they could be particularly useful means of coordination, especially for building a shared frame of reference and as an enhancement of communication. However, such use of visions requires significant investments and, ideally, a relatively stable contextual environment to make large (infrastructural) investments in the gas sector, or to overcome other inert sectoral institutional developments. Visions can identify such structural issues, as well as explore potential solutions. Futures studies also offer

methods for identifying uncertainties and potential futures to enable anticipation of unforeseen consequences (explorative foresight). While this is less active than actually shaping the future, is a suitable exercise for gaining insight into potential future trends. However, when large sectoral investments need to be made in polycentric government issues, in accordance with future needs and desires, a combination of analytical vision analysis and action-oriented visions is advisable.

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References

- [1] K. Yafimava, The EU Third Package and the Gas Target Model: Major Contentious Issues Inside and Outside the EU. Working Paper NG-75, Oxford Institute for Energy Studies, 2013.
- [2] ACER, European Gas Target Model; review and update, (2015) Digital version: <http://www.acer.europa.eu/events/presentation-of-acer-gas-target-model-/documents/european%20gas%20target%20model%20review%20and%20update.pdf> . Consulted: 21 July 2017.
- [3] CEER, Gas target model shows how to achieve an EU gas market by 2014, (2011) Digital version: https://www.ceer.eu/eeer_publications/press_releases/press_release_gas_target_model_shows_how_to_achieve_an_eu_gas_market_by_2014 . Consulted: 21 July 2017.
- [4] CEER, CEER vision for a European Gas Target Model, Conclusions paper. 1 December, (2011).
- [5] J.M. Glachant, A vision for the EU gas target model: MECO-s, in: J.M. Glachant, M. Hallack, M. Vazquez (Eds.), Building Competitive Gas Markets in the EU, Edward Elgar Publishing Limited, Cheltenham, UK, 2013.
- [6] EC, Meeting of the European Electricity Regulatory Forum. Florence, May, (2017) Digital version: <https://ec.europa.eu/energy/en/events/meeting-european-electricity-regulatory-forum-florence> . Consulted: 8 September 2017.
- [7] A. Correljé, M. Groenleer, J. Veldman, Understanding institutional change: the development of institutions for the regulation of natural gas supply systems in the US and the EU, *Compet. Regul. Netw. Ind.* 15 (1) (2014) 2–13.
- [8] H. Van Lente, A. Rip, The rise of membrane technology: from rhetorics to social reality, *Soc. Stud. Sci.* 28 (2) (1998) 221–254.
- [9] K. Konrad, J. Markard, A. Ruef, B. Truffer, Strategic responses to fuel cell hype and disappointment, *Technol. Forecast. Soc. Change* 79 (6) (2012) 1084–1098, <http://dx.doi.org/10.1016/j.techfore.2011.09.008>.
- [10] M. Borup, N. Brown, K. Konrad, H.V. Lente, The sociology of expectations in science and technology, *Technol. Anal. Strat. Manage.* 18 (3–4) (2006) 285–298, <http://dx.doi.org/10.1080/09537320600777002>.
- [11] M. Dignum, The Power of Large Technological Visions: The Promise of Hydrogen Energy (1970–2010). Ph.D. Thesis, Eindhoven University of Technology, BOX-press, 's Hertogenbosch, 2013.
- [12] B. Budde, F. Alkemade, K.M. Weber, Expectations as a key to understanding actor strategies in the field of fuel cell and hydrogen vehicles, *Technol. Forecast. Soc. Change* 79 (6) (2012) 1072–1083, <http://dx.doi.org/10.1016/j.techfore.2011.12.012>.
- [13] H. Van Lente, Promising Technology; The Dynamics of Expectations in Technological Developments. Ph.D. Thesis, Twente University, Enschede, 1993.
- [14] H. Van Lente, Navigating foresight in a sea of expectations: lessons from the sociology of expectations, *Technol. Anal. Strat. Manage.* 24 (8) (2012) 769–782, <http://dx.doi.org/10.1080/09537325.2012.715478>.
- [15] M. Michael, Futures of the present: from performativity to prehension, in: N. Brown, B. Rappert, A. Webster (Eds.), *Contested Futures: A Sociology of Prospective Techno-science*, Ashgate Publishing Company, Aldershot, England, 2000, pp. 21–39.
- [16] Contested futures: a sociology of prospective Futures: A Sociology of Prospective Techno-science, in: N. Brown, B. Rappert, A. Webster (Eds.), *Ashgate Publishing Company, Aldershot, England, 2000*, pp. 175–208.
- [17] A. Goldthau, B.K. Sovacool, The uniqueness of the energy security, justice, and governance problem, *Energy Policy* 41 (2012) 232–240.
- [18] A. Goldthau, Rethinking the governance of energy infrastructure: scale, decentralization and polycentrism, *Energy Res. Soc. Sci.* 1 (2014) 134–140.
- [19] J. Stern, H. Rogers, The Dynamics of a Liberalised European Gas Market: Key Determinants of Hub Prices, and Roles and Risks of Major Players. Working Paper NG-94, Oxford Institute for Energy Studies, 2014.
- [20] A. Correljé, The European natural gas market, *Curr. Sustain./Renew. Energy Rep.* 3 (1–2) (2016) 28–34.
- [21] J. Makhholm, Regulation of natural gas in the United States, Canada and Europe: prospects for a low carbon fuel, *Rev. Environ. Econ. Policy* 9 (1) (2015) 107–127.
- [22] M. Vazquez, M. Hallack, J.-M. Glachant, Designing the European gas market: more liquid & less natural? *Econ. Energy Environ. Policy* 1 (3) (2012) 25–38.
- [23] S. Bouzarovski, M. Bradshaw, A. Wochnik, Making territory through infrastructure: the governance of natural gas transit in Europe, *Geoforum* 64 (2015) 217–228.
- [24] K. Westphal, Institutional change in European natural gas markets and implications for energy security: lessons from the German case, *Energy Policy* 74 (2014) 35–43.
- [25] O.G. Austvik, The energy union and security-of-gas supply, *Energy Policy* 96 (2016) 372–382.
- [26] M.C. Aoun, S. Cornot-Gandolphe, The European Gas Market Looking for Its Golden Age? Institut Français de Relations Internationales (IFRI), Paris, 2015.
- [27] A. Correljé, Natural gas: a tale of three markets, in: M. Finger, C. Jaag (Eds.), *The Routledge Companion to Network Industries*, Routledge, London, 2016.
- [28] P. Heather, The Evolution of European Traded Gas Hubs, Oxford Institute for Energy Studies, 2015.
- [29] L.L. Delina, A. Janetos, Cosmopolitan, dynamic, and contested energy futures: Navigating the pluralities and polarities in the energy systems of tomorrow, *Energy Res. Soc. Sci.* (2018) 35.
- [30] CEER, Vision paper for a conceptual model for the European gas market—Call for evidence, (2010) Ref: C10-GWG-70- 03, 3 November 2010.
- [31] CIEP, CIEP vision on the gas target model. Clingendael International Energy Programme, (2011) Digital version: <http://www.clingendaelenergy.com/publications/publication/ciep-vision-on-the-gas-target-model> . Consulted: 21 July 2017.
- [32] Ascari, An American model for the EU gas market? EUI working paper, European University Institute, 2011 Digital version: http://cadmus.eui.eu/bitstream/handle/1814/18056/RSCAS_2011_39.pdf . Consulted: 21 July 2017.
- [33] Moselle, Market Design for Natural gas: The Target Model for the Internal Market, LEGG, 2011 Digital version: http://www.energy-regulators.eu/portal/page/portal/EEER_HOME/EEER_CONSULT/CLOSED%20PUBLIC%20CONSULTATIONS/GAS/GTM_CFE/Tab1/LECG%20Gas_Target_Model_0700311.pdf . Consulted: 21 July 2017.
- [34] S. Ascari, J.M. Glachant, A gas target model for the European Union: Contrasting MECOS and EURAM proposal. Policy Brief, Florence School of Regulation, (2011) Digital version: http://cadmus.eui.eu/bitstream/handle/1814/20776/PB_2011_08_online.pdf?sequence=1 . Consulted: 21 July 2017.
- [35] Madrid Forum, Conclusions paper. Meeting 21, 22–23 March, (2012) Digital version: 03_MadridForum_endorses%20GTM_2012-03-23.pdf. Consulted: 21 July 2017.
- [36] Gasterra, The long road to a functioning and reliable gas market, (2015) Digital version: www.gasterra.nl/en/news/the-long-road-to-a-functioning-and-reliable-gas-market . Consulted: 21 July 2017.
- [37] Consultant Frontier, Target model for the European natural gas market, (2011) Digital version: <http://www.frontier-economics.com/documents/2011/06/target-model-for-the-european-natural-gas-market-frontier-report.pdf> . Consulted: 21 July 2017.
- [38] ACER, Problem identification—Recent changes in the legal framework, market dynamics and system requirements, (2013) Digital version: http://www.acer.europa.eu/Media/Events/Workshop_on_the_Gas_Target_Model-review_and_update/Document%20Library/1/GTM%20update%20-justification%20and%20problem%20identification%20-%20Presentation%20by%20Walter%20Boltz,%20ACER.pdf . Consulted: 7 September 2017.
- [39] ACER, Energy regulation: A bridge to 2025 conclusions paper, (2014) Digital version: http://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/SD052005/Supporting%20document%20to%20ACER%20Recommendation%202005-2014%20-%20%20Energy%20Regulation%20A%20Bridge%20to%202025%20Conclusions%20Paper.pdf . Consulted: 21 July 2017.
- [40] ACER, Energy Regulation: A Bridge to 2025 Conclusions Paper, Agency for the Cooperation of Energy Regulators, September, (2014) Digital version: http://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/SD052005/Supporting%20document%20to%20ACER%20Recommendation%202005-2014%20-%20%20Energy%20Regulation%20A%20Bridge%20to%202025%20Conclusions%20Paper.pdf . Consulted: 7 September 2017.
- [41] ACER, Our Vision: A Competitive, Secure European Gas Market That Benefits All Consumers, Agency for the Cooperation of Energy Regulators, 2012 Digital version: <http://www.acer.europa.eu/Gas/Gas-Target-Model/Pages/Main.aspx> . Consulted: 7 September 2017.
- [42] ACER, Presentation of ACER Gas Target Model, (2015) Digital version: <http://www.acer.europa.eu/Events/Presentation-of-ACER-Gas-Target-Model-/default.aspx> . Consulted: 7 September 2017.
- [43] ACER, 2nd ACER Gas Target Model Workshop, Agency for the Cooperation of Energy Regulators, Ljubljana, 19 March, (2014) Digital version: <http://www.acer.europa.eu/Media/Events/2nd-ACER-Gas-Target-Model-Stakeholder-Workshop/Documents/01%20Boltz%20Intro.pdf> . Consulted: 7 September 2017.
- [44] ACER, 3rd ACER Gas Target Model Workshop, Agency for the Cooperation of Energy Regulators, Brussels, 15 May, (2014) Digital version: <http://www.acer.europa.eu/Media/Events/3rd-Gas-Target-Model-Stakeholders-Workshop/Documents/09.%20Hesseling%20Upstream%20competition.pdf> . Consulted: 7 September 2017.
- [45] ACER, Problem identification—Recent changes in the legal framework, market dynamics and system requirements. Vienna, 8 October, (2013) Digital version: http://www.acer.europa.eu/Media/Events/Workshop_on_the_Gas_Target_Model-review_and_update/Document%20Library/1/GTM%20update%20-justification%20and%20problem%20identification%20-%20Presentation%20by%20Walter

- %20Boltz,%20ACER.pdf . Consulted: 7 September 2017.
- [46] A. Wiek, D. Iwaniec, Quality criteria for visions and visioning in sustainability science, *Sustain. Sci.* 9 (4) (2014) 497–512, <http://dx.doi.org/10.1007/s11625-013-0208-6>.
- [47] H. Van Lente, *Forceful futures: from promise to requirement*, *Contested Futures: A Sociology of Prospective Techno-science*, Ashgate Publishing Company, Aldershot, England, 2000, pp. 43–64.
- [48] M. Dierkes, U. Hoffman, L. Marz, *Visions of Technology: Social and Institutional Factors Shaping the Development of New Technologies*, Campus Verlag, Frankfurt, 1996.
- [49] J.L. Austin, J.O. Urmson, M. Sbisà (Eds.), *How to Do Things with Words: The William James Lectures Delivered at Harvard University in 1955, 1955*.
- [50] D. MacKenzie, F. Muniesa, L. Sui, *Do Economists Make Markets?* Princeton University Press, 2008.
- [51] M. Callon, What does it mean to say that economics is performative? *CSI Working papers series*, (2006) Digital version: <https://halshs.archives-ouvertes.fr/halshs-00091596/document> . Consulted 21 July 2017.
- [52] P. Van der Duin, Introduction, in: P. Van der Duin (Ed.), *Foresight in organizations: Methods and tools*, Routledge, 2016, pp. 1–10.
- [53] P. Späth, H. Rohrer, 'Energy regions': the transformative power of regional discourses on socio-technical futures, *Res. Policy* 39 (4) (2010) 449–458, <http://dx.doi.org/10.1016/j.respol.2010.01.017>.
- [54] O.D. Da Costa, P. Warnke, C. Cagnin, F. Scapolo, The impact of foresight on policy-making: insights from the FORLEARN mutual learning process, *Technol. Anal. Strat. Manage.* 20 (3) (2008) 369–387, <http://dx.doi.org/10.1080/09537320802000146>.
- [55] C. Cagnin, D. Loveridge, O. Saritas, FTA and equity: new approaches to governance, *Futures* 43 (3) (2011) 279–291, <http://dx.doi.org/10.1016/j.futures.2010.11.006>.
- [56] A.L. Porter, W.B. Ashton, G. Clar, J.F. Coates, K. Cuhls, S.W. Cunningham, W. Thissen, *Technology futures analysis: toward integration of the field and new methods*, *Technol. Forecast. Soc. Change* 71 (3) (2004) 287–303.
- [57] J.P. Voss, B. Truffer, K. Konrad, *Sustainability foresight: reflexive governance in the transformation of utility systems*, in: J.P. Voss, D. Bauknecht, R. Kemp (Eds.), *Reflexive Governance for Sustainable Development*, Edward Elgar Publishing Limited, Cheltenham, 2006, pp. 162–188.
- [58] F. Berkhout, Normative expectations in systems innovation, *Technol. Anal. Strat. Manage.* 18 (3–4) (2006) 299–311, <http://dx.doi.org/10.1080/09537320600777010>.
- [59] A. Smith, A. Stirling, F. Berkhout, The governance of sustainable socio-technical transitions, *Res. Policy* 34 (10) (2005) 1491–1510, <http://dx.doi.org/10.1016/j.respol.2005.07.005>.
- [60] J. Grin, Vision assessment to supporting shaping the 21st century society? Technology assessment as a tool for political judgement, in: J. Grin, A. Grunwald (Eds.), *Vision Assessment: Shaping Technology in 21st Century Society*, Springer, Berlin, Heidelberg, New York, 2000.
- [61] A. Grunwald, Visions assessment as a new element of the FTA toolbox, EU-US seminar: New technology foresight, forecasting & assessment methods, (2004) Digital version: <http://foresight.jrc.ec.europa.eu/fta/papers/Session%204%20What%27s%20the%20Use/Vision%20Assessment%20as%20a%20new%20element%20of%20the%20FTA%20toolbox.pdf> . Consulted: 30 June 2017.
- [62] N. Brown, Hope against hype—accountability in biopasts, presents and futures, *Sci. Stud.* 16 (2) (2003) 3–21.
- [63] J. Grin, A. Grunwald, *Vision Assessment: Shaping Technology in 21st Century Society: Towards a Repertoire for Technology Assessment*, Springer, Berlin, Heidelberg, 2000.
- [64] J. Hedrén, Shaping sustainability: is there an unreleased potential in utopian thought? *Futures* 41 (4) (2009) 220–225, <http://dx.doi.org/10.1016/j.futures.2008.09.005>.
- [65] S. Sondejker, J. Geurts, J. Rotmans, A. Tukker, Imagining sustainability: the added value of transition scenarios in transition management, *Foresight* 8 (5) (2006) 15–30, <http://dx.doi.org/10.1108/14636680610703063>.
- [66] S. Jasanoff, S.-H. Kim, Sociotechnical imaginaries and national energy policies, *Sci. Cult.* 22 (2) (2013) 189–196, <http://dx.doi.org/10.1080/09505431.2013.786990>.
- [67] A. Smith, A. Stirling, F. Berkhout, The governance of sustainable socio-technical transitions, *Res. Policy* 34 (10) (2005) 1491–1510, <http://dx.doi.org/10.1016/j.respol.2005.07.005>.
- [68] J. Rotmans, R. Kemp, M. Van Asselt, More evolution than revolution: transition management in public policy, *Foresight* 3 (1) (2001) 15–31, <http://dx.doi.org/10.1108/14636680110803003>.
- [69] K. Bickerstaff, G. Walker, Shared visions, unholy alliances: power, governance and deliberative processes in local transport planning, *Urban Stud.* 42 (5) (2005) 2123–2144.
- [70] E. Shove, Efficiency and consumption: technology and practice, *Energy Environ.* 15 (6) (2004) 1053–1065, <http://dx.doi.org/10.1260/0958305043026555>.
- [71] C.E. Lindblom, The science of muddling through, *Public Adm. Rev.* 19 (2) (1959) 79–88, <http://dx.doi.org/10.2307/973677>.
- [72] R. Van der Helm, The vision phenomenon: towards a theoretical underpinning of visions of the future and the process of envisioning, *Futures* 41 (2) (2009) 96–104, <http://dx.doi.org/10.1016/j.futures.2008.07.036>.
- [73] N. Cass, G. Walker, Emotion and rationality: the characterisation and evaluation of opposition to renewable energy projects, *Emot. Space Soc.* 2 (1) (2009) 62–69, <http://dx.doi.org/10.1016/j.emospa.2009.05.006>.
- [74] ACM, Consultation: the functioning of the wholesale gas market in the Netherlands, (2016) Digital version: <https://www.acm.nl/en/publications/publication/16526/Consultation-the-functioning-of-the-wholesale-gas-market-in-the-Netherlands/> . Consulted: 7 September 2017.
- [75] EC, Towards Energy Union: The Commission presents sustainable energy security package. 16 February, (2016) Digital version: http://europa.eu/rapid/press-release_IP-16-307_en.htm?locale=FR . Consulted: 7 September 2017.
- [76] ACER, ACER/CEER annual report on the results of monitoring the international electricity and natural gas markets in 2015, (2015) Digital version: http://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Publication/ACER_Market_Monitoring_Report_2015.pdf . Consulted: 7 September 2017.
- [77] A.G.M. La Viña, J.M. Tan, T.I.M.P. Guanzon, M.J. Caleda, L. Ang, Navigating a trilemma: energy security, equity, and sustainability in the Philippines' low-carbon transition, *Energy Res. Soc. Sci.* (2018) 35.
- [78] A. Stratigea, M. Giaoutzi, Linking global to regional scenarios in foresight, *Futures* 44 (2012) 847–859.
- [79] E. Ostrom, Polycentric systems for coping with collective action and global environmental change, *Global Environ. Change* 20 (2010) 550–557.
- [80] M. Dignum, Connecting visions of a future renewable energy grid, in: D.J. Scholten (Ed.), *The Geopolitics of Renewables*, Springer, 2018ch 10 (forthcoming).
- [81] E. Schirmer, P. Warnke, Envisioning structural transformation — lessons from a foresight project on the future of innovation, *Technol. Forecasting Soc. Change* 80 (3) (2013) 453–466, <http://dx.doi.org/10.1016/j.techfore.2012.10.008>.
- [82] K. Konrad, The social dynamics of expectations: The interaction of collective and actor-specific expectations on electronic commerce and interactive television, *Technol. Anal. Strategic Manage.* 18 (3–4) (2006) 429–444, <http://dx.doi.org/10.1080/09537320600777192>.
- [83] S. Bakker, The car industry and the blow-out of the hydrogen hype, *Energy Policy* 38 (11) (2010) 6540–6544, <http://dx.doi.org/10.1016/j.enpol.2010.07.019>.
- [84] M. Hajer, W. Versteeg, A decade of discourse analysis of environmental politics: Achievements, challenges, perspectives, *J. Environ. Policy & Plann.* 7 (3) (2005) 175–184, <http://dx.doi.org/10.1080/15239080500339646>.
- [85] G.C. Unruh, Understanding carbon lock-in, *Energy Policy* 28 (12) (2000) 817–830, [http://dx.doi.org/10.1016/S0301-4215\(00\)00070-7](http://dx.doi.org/10.1016/S0301-4215(00)00070-7).
- [86] L. Parmigiani, The European gas market. A reality check, *Gouvernance européenne et géopolitique de l'énergie* May, (2013) https://inis.iaea.org/search/search.aspx?orig_q=RN:46034984 Consulted: November 8 2017.