

Mediating Power-to-X

A case study of green imaginaries and environmental conflicts in local Danish news media

ANDERS HORSBØL

DEPARTMENT OF COMMUNICATION AND PSYCHOLOGY, AALBORG UNIVERSITY,
DENMARK

ABSTRACT

Recently, Power-to-X (PtX) has come to play a prominent role in the public discussion of a green energy future, with high hopes expressed by political and business players. In the Danish news media, PtX has experienced a steep rise in attention, which calls for studies of how PtX is made sense of as a societal, not only a technological, phenomenon. Informed by the notion of sociotechnical imaginaries, this article investigates the local introduction of PtX in Frederica, one of the forerunner towns for PtX in Denmark, as represented in the coverage of the daily newspaper *Fredericia Dagblad*. The study analyses how PtX is made sense of by being connected to local actors, circumstances, and imagined futures. Two diverging sociotechnical imaginaries are identified, centring on 1) local (business) cooperation for green energy solutions towards a PtX adventure, and 2) concerns for scarce nature in a densely industrialised area. The findings show both similarities with and differences to already known mediated environmental conflicts and point to dynamics between media, market, politics, and civil society in future mediated environmental conflicts.

KEYWORDS: local media, mediated environmental conflicts, Power-to-X, sociotechnical imaginaries, discourse analysis

Introduction

In the public debate on green energy transition, the technology of Power-to-X (PtX) is increasingly referred to as a promising way to provide renewable energy for a future green energy system. However, while PtX can be relatively well defined as a set of technologies, the societal implications of PtX are far from

clear. These implications include questions as to how PtX may impact different groups, contribute to societal goods and values, or pose risks and challenges for people and the environment. As these issues are beginning to be addressed, PtX is gradually emerging as a matter of societal importance. The news media plays a key role in this transition of PtX from a mainly scientific and technological phenomenon to one with broader societal implications. This is first due to the news media's basic ability to broadcast, that is, to distribute content to wider audiences beyond specialist or expert circles. Second, and more importantly, it is due to the news media as a counterpoint to the functional differentiation and knowledge specialisation of modern societies (Luhmann, 1996). Thus, the news media generally needs to address topics in a publicly accessible language and in a way that is relatable and worthy of attention for audiences without specialist or technical knowledge, with variations in style among different types of news media. This means that the news media representation of PtX provides a window for exploring how PtX is made understandable in a non-specialist vocabulary and how it is made to matter as a newsworthy issue. Thereby, the news media *mediates* PtX in a more fundamental way by providing a vocabulary for making sense of PtX and for legitimising further actions on PtX (Scollon, 2001). This applies to other new energy technologies as well, such as carbon capture and storage or "green" fuels, as they must also be articulated in ordinary language to become meaningful discursive objects for public negotiation.

The news media is not one entity, but rather a diverse set of public arenas with varying local, national, and international range. The purpose of this article is to cast light on how local news media makes sense of PtX, including how PtX is considered to provide opportunities and challenges for local actors and to influence qualities of the local site. Thus, the study examines the local introduction of PtX as the technology is articulated as relevant and consequential for the future of local actors, communities, and environments. The focus on the local thereby includes two aspects that narrow down the scope of the study: an empirical selection of a local news media with a spatially limited range, and an analytical attention to how PtX is connected to local issues in the media coverage, not least by representing future impacts of PtX in the local area. In this way, the aim of the article is to contribute to a wider range of research on the public discussion of new energy technologies as these play out in local media arenas (Díaz-Pont et al., 2020) and become related to social issues (Hansen, 2015).

The term PtX covers several technologies by which renewable electricity is used to produce hydrogen through electrolysis. Subsequently, hydrogen can be directly used as a fuel, or it can be converted into other fuels, chemicals, and materials. These processes were coined Power-to-X in the early 2010s (Sterner & Specht, 2021) and have received "extensive attention from academic, corporate, and governmental perspectives at a global scale in the context of energy and transportation" (Palys & Daoutidis, 2022: 2). This includes a strong increase in publications about PtX (Skov et al., 2021) and commercial representations of PtX as "the key to a CO₂-free future" (Siemens Energy, 2021). It is argued that the technology can provide renewable fuels for forms of transportation that are

difficult to electrify directly, such as long-distance flights and freight shipping. Moreover, PtX offers storage capacities for otherwise intermittent renewable energy sources such as wind turbines and photovoltaic systems, and it enables transport of energy over large geographical distances (Daiyan et al., 2020).

In Denmark, PtX plants are under construction or consideration at several sites, and high hopes are expressed from both business and political players. PtX has become an essential instrument for achieving the government's aim of 70 per cent reduction of CO₂ emissions by 2030 and the climate neutrality goal for 2045. The Danish government has formulated a PtX strategy (2021) that includes initiatives supporting the development of PtX technologies, a regulatory framework, and a PtX infrastructure (Danish Ministry of Climate, Energy and Utilities, 2021). Apart from the climate goal, The Danish Ministry of Foreign Affairs also points to business opportunities in Denmark for large-scale PtX projects (Ministry of Foreign Affairs in Denmark, n.d.). Beyond the government, an analysis of experts' perceptions from public authorities, academia, energy providers, and technology producers finds similar ideas on "the potential to make Denmark a knowledge hub for the development of P2X solutions" (Skov et al., 2021: 5).

PtX has entered the public debate in Denmark during the last few years and has received a steep rise in public attention. Thus, a search on the database Infomedia shows that the yearly occurrences of the term Power-to-X in Danish media outlets, including local, national, and digital news media, rose from zero in 2016 to more than 6,000 in 2022. A similar picture can be found for the shortened term PtX.

This rise in public attention calls for studies of how meaning is ascribed to the PtX technology as a societal issue, moving beyond simple positive or negative assessments and instead addressing how opportunities, benefits, risks, and concerns are articulated in association with PtX. Here, the media has a crucial role in expressing and circulating the future societal implications of PtX. This goes for the local news media as well, where PtX is made sense of by being related to local site qualities, opportunities, and risks. This article presents a case study of the local daily newspaper in Frederica, one of the (imagined) forerunner towns for PtX in Denmark. In examining the local introduction of PtX in Fredericia, the study is informed by the notion of "sociotechnical imaginaries" (Jasanoff & Kim, 2015) – that is, collective visions of desirable futures where new technologies are understood in relation to actors, practices, and identities. Thereby, the aim is to answer two research questions:

RQ1. Which sociotechnical imaginaries can be identified in the local news coverage of PtX concerning the local societal implications of PtX as a future energy technology?

RQ2. Which conflicts, if any, appear in these imaginaries, and how do they resemble or differ from other types of environmental conflicts, not least in relation to the green energy transition?

The article is structured as follows: First selected literature is presented that links green energy with the social dimension, centring on sociotechnical imaginaries and mediatised environmental conflicts. The next section paves the way for the analysis by briefly introducing the case, the selection of data, and the analytical approach, including the discursive operationalisation of the notion of sociotechnical imaginaries. The following empirical analysis is divided into three stages of the news coverage. Finally, the article concludes by returning to the research questions and discussing implications in relation to the literature.

Linking green energy and the social: Sociotechnical imaginaries and mediatised environmental conflicts

A prominent way of linking renewable energy technology and the social is associated with the term social acceptance (Ellis & Ferraro, 2016; Ellis et al., 2023; Rand & Hoen, 2017), often with reference to a triangle of sociopolitical, community, and market acceptance of renewable energy plants (Wüstenhagen et al., 2007). This approach has gained considerable traction over the last two decades and incorporated some criticism of reducing resistance against the placement of energy plants to NIMBY (Not In My Backyard) – that is, not taking into consideration issues of place attachment and concerns about distributive and procedural justice (Aitken, 2010; Devine-Wright, 2009). However, the notion of social acceptance is too narrow to capture how a renewable energy technology, in casu PtX, is made meaningful in the first place and simultaneously linked to the future of a local area. This process of constitutive meaning-making and localising (chrono)logically precedes the process of social acceptance, as it determines the social phenomenon that is to be accepted or not. Therefore, the notion of social acceptance is less suited as an overarching concept for theorising the linkage between the social and green energy technology in the current study.

Instead, “sociotechnical imaginaries” is employed as a guiding conceptual framework. Sociotechnical imaginaries are “collectively held, institutionally stabilised, and publicly performed visions of desirable futures, animated by shared understandings of forms of social life and social order attainable through, and supportive of, advances in science and technology” (Jasanoff & Kim, 2015: 4). This framework underscores the intertwining of the technological and social as well as the projection of understandings and ideals into the future. Therefore, it is well suited for analysing how PtX as a new technology is understood in relation to local actors, practices, norms, and identities (Jasanoff, 2004) and how imaginaries of a desired future for a local area are articulated. Sociotechnical imaginaries have been studied broadly in energy research with respect to different energy technologies, systems, and locations (Beck et al., 2021; Carvalho et al., 2022; Rudek & Huang, 2023; Simmet, 2018). The concept has been applied to renewable energy technologies, sustainability, and green transition, but imaginaries focusing on PtX are still to be investigated. Recent research has emphasised the spatial dimension imbued in sociotechnical imaginaries, for example, as “place imaginaries” (characteristics of a particular place), “idealised spaces”

(spaces sharing generic and universal characteristics), and “spatial transformation imaginaries” (narratives of generic processes by which spaces and places change), as outlined by Zoé and colleagues (2021).

As indicated, the framework of sociotechnical imaginaries is not limited to media studies, but is also applicable to policy networks, expert fora, or governmental institutions. In this article, however, the framework of sociotechnical imaginaries is used exclusively to conceptualise the study of the local news media coverage of PtX. Thus, the framework is used as a means for realising the article’s purpose of examining how the local news media make sense of PtX and thereby point to future opportunities and challenges for local actors, environments, and communities.

This use of sociotechnical imaginaries resonates with a well-established literature at the intersection between environmental communication, policy, and media studies, which draws on framing or discourse analysis in exploring representations of the environment. In the context of new energy technologies, the seminal work by Gamson and Modigliani (1989) on media representation of nuclear power in the US has shown how the media framing of energy technologies can change from an initial optimistic “progress” to a Frankenstein-like “runaway” understanding. Similarly influential within environmental discourse studies is the identification of a discourse of ecological modernisation (Hajer, 1995), where green considerations and environmental protection has come to be viewed as compatible with economic growth and innovative technologies, also referred to in Nordic media studies of environmental communication (Eskjær, 2019; Lischinsky & Sjölander, 2014). The same goes for Dryzek’s differentiation between a set of “discourses of the Earth”, such as a discourse of problem solving, sustainability, survivalism, and green radicalism, which sets the scene very differently for representing and evaluating new energy technologies (Dryzek, 2021). The discourse approach partly overlaps with media studies of culture-based values attached to the environment. For example, Hansen (2015: 212), in a review of longitudinal studies of television, advertising, and news magazines, concludes that media representation of the environment has shifted “from a romanticized, through a utilitarian/science/resource focused to a sustainability/nature-attuned view of our natural environment”. Zooming in on climate change, studies of climate journalism and media coverage point to recent developments, such as a shift from gatekeeping to curating roles for journalists, a diversification of sources, and a broadening spectrum of frames (Schäfer & Painter, 2021). Whereas these studies all provide inspiration and points of comparison for studies of sociotechnical imaginaries, the latter framework particularly invites a focus on the nexus of the social and technological, in casu PtX, along with attention to how this nexus is projected into the future.

Finally, there is an increasing body of research on conflicts over renewable energy plants (Kirkegaard et al., 2021; Le Billon, 2015; Rand & Hoen, 2017), including the so called green-on-green, or simply green, conflicts, where different environmental concerns collide (Eskjær & Horsbøl, 2023; Roddis et al., 2020; Warren et al., 2005). From a media studies perspective, a useful way of addressing

these conflicts is represented in the notion of mediatised environmental conflicts, formulated by Hutchins and Lester (2015). Drawing on theories of mediatisation (Hepp, 2013; Hjarvard, 2013), the term mediatised indicates the constitutive role of the news media along with structural implications for other social systems or institutions. Thus, the news media is seen as not just reporting on controversies, but as a site for enacting conflicting understandings of the environment with repercussions for other social fields. In the everyday practice of journalism, this is realised by drawing on news values (Galtung & Ruge, 1965; Gravengaard, 2010; Harcup & O'Neill, 2017), genre conventions, and combinations of semi-otic modalities such as written or spoken language, images, videos, sound, and so on (van Leeuwen, 2008). The use of news values, for instance, may differ significantly between countries, also when it comes to environmental issues, as several studies have shown (Nerlich et al., 2012; Huan, 2024).

The notion of mediatised environmental conflicts is applicable to local news media as well, which has received less attention than the (inter)national media (Díaz-Pont et al., 2020; Horsbøl, 2013). More specifically, Hutchins and Lester (2015: 339) delineated the meeting points of four spheres of action as particularly important for localising mediatised environmental conflicts: “(i) activist strategies and campaigns, (ii) journalism practices and news reporting, (iii) formal politics and decision-making processes, and (iv) industry activities and trade”. The current study draws on this approach as it explores how the local news media intersects with civil society, formal politics, and the market.

Furthermore, mediatised environmental conflicts represent different forms of politicisation. Issues are politicised “when they become the subject of deliberation, decision making and human agency where previously they were not” (Hay, 2007: 81). That is, an issue is not per se political or not, but it can be politicised when opened for debate and human agency – or, reversely, depoliticised when displaced from contestation and agency. To further differentiate, issues can undergo different stages of (de)politicisation. Hay (2007: 79) identified three stages of (de)politicisation: from the realm of necessity (where issues are not questioned at all) into the private sphere (where issues can be problematised in private arenas), further into the public sphere (where issues are debated in the news media and other public arenas), and finally into the governmental sphere (where issues become the object of legislative measures). Similar conceptualisations can be found by Stevenson and Dryzek (2014). In the current case study, politicisation is discussed in the discussion and conclusion section in relation to research question 2.

Case, data, and analytic strategy

Empirically, this article focuses on the local introduction of PtX. As mentioned, PtX projects have been launched at several locations in Denmark, and among the hopeful forerunners is the town of Fredericia, situated in the south-east part of the peninsula Jutland. One of the first hydrogen factories was established in Fredericia in 2021, and high ambitions were expressed of the town as a future

centre for PtX in Denmark due to its central location with respect to infrastructure and transportation as well as to its alleged business capacities.

The crux of the analysis will be the coverage in the local daily newspaper *Fredericia Dagblad* (FD). The paid-for newspaper is owned by the larger media company JFM (previously Jysk Fynske Medier) and has an estimated weekly readership of approximately 45,000 persons (jfm business, n.d.). FD is available in print and online versions and plays an important role in the ecology of local publics by selecting and framing issues and giving voice to various local actors.

The media analysis is divided into three stages: Stage 1 in 2020–2021 covers the process leading up to the municipal approval of the hydrogen factory and the turning of the first sod. Stage 2 represents a stabilising phase with additional PtX initiatives. Finally, Stage 3 covers the debate on a possible photovoltaic power station close to the hydrogen factory, mainly unfolding in the first half of 2023. The media texts have been accessed via the database Infomedia ($n = 64$). The analysis combines qualitative discourse studies with a smaller quantitative study of quoted media sources.

The analysis examines how PtX comes into being as a discursive object when made sense of locally and connected to local actors, issues, and circumstances. As described in the literature review, the articulation of PtX in the press coverage is guided by the concept of sociotechnical imaginaries. However, this is a rather open-ended concept that would benefit from analytical operationalisation. Informed by discourse studies (Fairclough, 2003; Jeffries, 2010; van Leeuwen, 1995), a sociotechnical imaginary is analysed as an articulation within four discursive dimensions:

- a societal problem or need, to which PtX is seen as a future response
- a set of actors and projected actions on PtX
- rationales for suggested PtX actions
- PtX-relevant qualities of the local site

The articulation of societal problems or needs sets the wider horizon of meaning within which PtX is understood. This implies that the problem understanding is not an effect of the technology as such but is constituted by the sociotechnical imaginary. In a similarly constitutive fashion, the articulation of actors and actions designates the forms of future agency ascribed to individuals, groups, organisations, or non-human agents in the sociotechnical imaginary, as well the types of actions considered important (Jeffries, 2010; van Leeuwen, 1995). The articulation of rationales for PtX comprises ways of reasoning about and evaluating PtX initiatives (Fairclough, 2003; Jeffries, 2010), thereby legitimising ways of addressing the societal problems or needs mentioned above. Finally, the articulation of PtX-relevant qualities of the local site connects the imaginary to a specific location and its geographic, historic, economic, or cultural features. In line with the discourse approach, the association of PtX with local site qualities involves an act of “placemaking” (Harvey, 1996), in which specific forms of

place identity and place attachment are articulated (Carbaugh & Cerulli, 2013). The four discursive dimensions of a sociotechnical imaginary occur in varying combinations and with varying salience in the different media texts. To target the sociotechnical imaginary as a more abstract notion, not always fully visible in the individual media text, they are analysed at a level beyond the individual text, but with rich text examples to substantiate the analysis. The Danish quotes have been translated to English by the author.

Findings

Stage 1. Establishing a hydrogen factory and a sociotechnical imaginary

On 17 August 2021, the first sod was turned for a new hydrogen factory in Fredericia. *FD* covered the event under the heading “Now the green transition starts on a field at Ydre Ringvej” (Hanghøj, 2021b), thus linking the singular event to the wider green transition. The then Danish climate minister took part in the launch, and the *FD* reportage showed a large photo of him smiling with the oil tanks of the nearby refinery in the background. The refinery, owned by Crossbridge Energy, is part of the partnership behind the factory, with the energy company Everfuel as building owner. The CEOs from both Everfuel and Crossbridge Energy were also shown in an *FD* photo, shovelling in their suits along with the climate minister and the head of the hydrogen business association in Denmark. The quotes from the climate minister, the Crossbridge CEO, and the Fredericia municipality mayor were in line with the heading, since they connected the launch of the hydrogen factory to the larger timescale of the green transition. “We do not just talk about reducing our CO₂-load. We act here and now”, the mayor said, contrasting mere talk with action and representing the launch as a sign of local, common agency. The quotes from the climate minister pointed explicitly to the “symbolic” character of the construction site with the refinery nearby, which was supposed to take part in the transition away from fossil fuels. In the same vein, the refinery CEO was quoted for describing the event as a “milestone”, signifying that the refinery moves from “black” to “green” energy.

Apart from these voices speaking in unison, another, less prevalent trace was also present in the reportage. In the last clause of the lead paragraph, *FD* noted that the first sod was turned for a “disputed plant”. In the body text, this was elaborated with a short resumé of the local political process, noting that the “the district plan was approved by the town council before the summer break, but not without debate on security and future”. Moreover, *FD* specified that “the whole town council minus Nye Borgerlige” (a smaller right-wing party) chose to approve the district plan. Thus, indications of political controversies and contestation were part of the coverage as well, although less pronounced, and framed by the reference to a wide-ranging political consensus.

FD’s reportage is illustrative for the coverage in 2020 and 2021 leading up to the launch of the hydrogen factory. A prevalent sociotechnical imaginary (STI1),

connecting PtX to the site of Fredericia, can be summarised with the following storyline: “Local cooperation is crucial for green energy solutions”. Or, as expressed in a letter to the editor by a local CEO: “Only by working together can we achieve green transport solutions” (Rasmussen, 2021).

In STI1, the societal problem was generally represented as climate change, or more specifically, the development of more climate-friendly fuels to meet the Danish climate goals. As for the set of actors and actions, action keywords were “cooperate” and “utilise potential synergies” (Rasmussen, 2021). Those who were to cooperate were mostly projected as a range of energy companies and local municipalities in the so-called Triangle region, where Fredericia is located, but also educational institutions were sometimes mentioned, for instance, in a letter to the editor by a town council member from the left-wing Socialist People’s Party (SF) (Laursen, 2021). One common rationale legitimising the imagined PtX actions was, unsurprisingly, the global climate contribution, but other main rationales were present too, such as the creation of growth and local jobs. Finally, as for the local site qualities, the Triangle region was described as particularly suited for taking on a future leading role on PtX, as argued by the CEO of a heat transmission company in the Triangle region:

We have companies with unique hydrogen solutions and production technologies, we have specialist skills in the companies, and we have a perfect infrastructure where both the national electricity grid, the national gas grid, and the regional district heating grid meet. (Kruse, 2021)

Furthermore, this characterisation was linked to the metaphor of turning the Triangle region into “a lighthouse for Northern Europe in the production of green fuels” (Kruse, 2021) or into a “Power-to-X adventure” (Kruse, 2021). Finally, the future trajectory was sometimes deepened by a past dimension, in the light of which PtX poses an opportunity to move away from the history of Frederica as a town with an “old fashioned polluting industry” (Laursen, 2021). Utilising PtX was thereby viewed as a stepping stone to transforming the identity of the town.

Although this imaginary was prevalent in the coverage, it did not stand alone. *FD* also represented the establishment of the hydrogen factory as a political controversy, where diverging positions were voiced. In an early phase, the scepticism towards the plan covered a broader part of the political spectrum, since the large opposition party Venstre (centre-right) uttered concerns, but after a public hearing, Venstre hesitantly ended up supporting the plans, and the opposition in the municipal council was represented by just one candidate of the right-wing party Nye Borgerlige. From that quarter, however, a pronounced criticism was expressed. Several aspects were addressed, such as the energy supply to and the safety of the hydrogen factory, the distribution of hydrogen away from the factory, and the preparedness in case of accidents or terrorism (Killerich, 2021). The criticism also questioned the job rationale, and most notably, the imaginary of Frederica as moving from a “black” past to a “green” future, as in the following paragraph from a letter to the editor, published in the wake of the town council’s approval:

We were Denmark's answer to the infamous Ruhr district in Germany until 2004. Smoke, noise, dung and dirt, and catastrophic pollution of the Little Belt made it worth the effort to drive far around Fredericia. Do we have new times? (Byrgesen, 2021)

While aligning with the ambition to move from “black” to “green”, the rhetorical question at the end puts a question mark on the narrative of the hydrogen factory as a pathway to a greener future. Likewise, by the long list of colloquial terms for environmental damage, and by evoking the infamous Ruhr district, a less attractive destination for the PtX realisation in Fredericia stands vividly out.

However, this criticism did not gain traction in the *FD* coverage. Neither politicians in the town council nor other societal actors gathered around the critical articulations and helped constitute a counter-imaginary that would delegitimise the hydrogen factory. Perhaps most striking was the absence of civil society voices in the coverage; there were no traces of citizen protests or resistance against the hydrogen factory. Quite tellingly, *FD* could report that no objections were made in a public hearing by the Danish Environment Agency, preceding the decision of the town council (Hanghøj, 2021a).

Stage 2. Fredericia business synergies: Expanding the sociotechnical imaginary

After the launch of the hydrogen factory, *FD* covered a variety of local PtX initiatives in addition to the Everfuel hydrogen factory. The dissenting voice of the city council member from Nye Borgerlige was still represented but remained marginal. Instead, the bulk of the coverage was non-conflictual and presented as informative rather than controversial. The STI1 was generally substantiated and expanded. While the articulation of the urging problem and the rationales were unchanged, some modifications could be observed in the articulation of actors and site qualities.

Concerning the actors, the orientation towards business actors was further expanded in several ways. First, quite a few businesses appeared as the primary news topic. For example, one article reported on the energy company Green Hydrogen Systems, including their financial statement and expectations for the coming year (Holm, 2022). Another reported that yet another hydrogen company, H2 Energy Esbjerg Aps, bought a lot in Fredericia and planned to establish a production site (Sparre, 2022a). And a third article reported that the Everfuel hydrogen factory succeeded in producing the first amount of hydrogen (Sparre, 2022b).

Second, the business perspective was also manifest at a level beyond the news on each single company. Thus, a smaller part of the *FD* coverage thematised business collaboration, partnerships, and synergies, and linked this to the position of Fredericia in the PtX field. Moreover, the types of collaborative action outlined are a step more concrete than in Stage 1. Several specific businesses were mentioned, as were the synergies between them (Hanghøj, 2023a).

Third, businesses were not only objects of the *FD* coverage, but were also quoted to a high extent. Counting all quotations in the coverage of PtX within one year (see Table 1 for an overview) shows that business actors (including private and publicly owned businesses) were by far the most quoted source in the *FD* coverage. The counting covered articles mentioning brint [hydrogen] or Power-to-X, including direct quotations and paraphrases with an explicit source reference. A source was only counted once per article.

It is striking that business representatives accounted for more than half of the total amount of quoted sources. The business field was thereby given a pivotal voice in the PtX imaginary, encompassing a variety of representatives from PtX producers, energy distributors, a green tech company, the local refinery, the harbour, and the utility. Thus, though the businesses formed a dominant source, it was a source with multiple individual voices.

National actors such as politicians, ministries, or agencies had a limited voice, along with individual citizens. Even less important were nongovernmental organisations, academic experts, and other media, subsumed under the category “Other”.

Finally, the municipal administration and the local politicians altogether accounted for almost half of the business quotations, underlining the local orientation of the coverage. In the category of local politicians, the mayor stood out as by far the most quoted. He often linked the individual business news to a larger narrative of Fredericia. For example, when *FD* reported that another hydrogen company was buying a lot in Fredericia, the mayor’s statement read: “The sale of the lot strengthens Fredericia’s position as a hub for future Power-to-X and green transition” (Sparre, 2022a). This way of causally connecting individual business events and the position of Fredericia in general thus helped maintain and consolidate the Fredericia PtX imaginary.

TABLE 1 Quoted sources in the *FD* coverage of PtX, February 2022–January 2023

Source	Number of quotations
Businesses	42
Local politicians	13
National politicians	7
Municipal administration	6
Citizens	5
Ministries and state agencies	5
Other	3

Comments: *N* = 38

Concerning the site qualities, the coverage in Stage 2 centred on Fredericia – rather than the wider Triangle region – as the site where the PtX collaboration took place. Moreover, Fredericia was not just represented as a geographical location, but was sometimes ascribed an agency of its own, for example, in an article with the heading “Fredericia will deliver the green fuels of the future” (Hanghøj, 2023a). Here, Fredericia was represented as a single, united agent and ascribed intentions and capacities. Finally, reference was several times made to the uniqueness of the Fredericia site concerning PtX collaborations and synergies between businesses, both nationally, as the “only place in Denmark” (Hanghøj, 2023a), and internationally, as in the following quote from a green-tech entrepreneur:

The location is unique. Because the opportunities that come right here in Fredericia are not found anywhere else in the world. It exists only in one place in the world on that scale. You have access to oxygen from the hydrogen production. And you can get rid of the surplus heat to the refinery. (Madsen, 2023)

Stage 3: Solar power plant controversies and a new imaginary

In the first half of 2023, *FD* published several articles about a plan of two energy companies to establish a photovoltaic plant close to Fredericia, not far from the hydrogen factory. The news articles reported on a meeting between energy companies and parts of the municipal council (Hanghøj, 2023b), the municipal council’s decision on the plans (Hanghøj, 2023c), and a public meeting organised by one of the energy companies for the citizens living close to the planned facility (Hanghøj, 2023d, 2023e). In addition, a letter to the editor by two municipal politicians (Vind & Olsen, 2023) and an editorial (Hagmund-Hansen, 2023) were published in the issue. In these pieces, energy companies, municipal politicians, and local citizens were quoted. Unlike Stages 1 and 2, however, these voices differed significantly and transgressed the dominant sociotechnical imaginary. As a result, a new sociotechnical imaginary emerged, which can be termed “caring for our scarce green areas” (STI2).

In STI2, the societal problem centred on the use of land in a densely populated area, where nature, good farmland, and recreational areas were scarce goods. Thus, the local access to nature and valuable places was considered to be threatened by the projected solar power plant.

Concerning key actors and actions, the local citizens played a stronger role in this imaginary. While it was reported that most landowners were willing to take part in the project (i.e., rent their land possession for 30 years), citizens were mainly represented as in opposition to the photovoltaic plans. Quite tellingly, the headline of the report from the public meetings read: “The neighbours to solar panels behind the refinery say no thanks” (Hanghøj, 2023e). The concerns of the local citizens were personalised in an interview with an elderly couple living close to the planned facility. The couple, as reported by *FD*, “love their small farm” (Hanghøj, 2003d) where they have lived for 48 years, but now they “feel their small oasis threatened” (Hanghøj, 2023d). The use of mental processes

such as “feeling” and “loving” foregrounds the citizens’ emotional bond to a specific place (Martin & Rose, 2003).

Energy businesses and municipalities were represented as actors too, but different from STI1. In STI2, the energy companies were often represented as a threat to local access to scarce nature, and in addition, as short-circuiting the democratic process. The later criticism was uttered by a representative from the municipal council, who described the companies’ engagement with the local citizens before the approval of the council as “entering through the back way” (Hanghøj, 2023d), of which he did not approve. In response, the municipal council decided to launch a “screening” of the entire municipality to map the possibilities for solar power plants and other renewable energy facilities in addition to already approved plans of placing solar panels on (industrial) roofs (Hanghøj, 2023c). With this move, the municipal council postponed the decision on the specific site until after the screening process. Moreover, the council argued that it “also invites the citizens into the decision-making process” (Hanghøj, 2023c), for instance, in the form of public hearings. Thereby, the citizens were positioned as actors in the local democracy as well.

The energy companies, while often criticised, were also quoted to a wide extent. On the one hand, they pointed to the climate contribution of the photovoltaic plant and to the synergy with the planned hydrogen factory, which resonates well with STI1. On the other hand, they argued with reference to the democratic and dialogical character of their initiative, in the sense that “we want to engage in an early dialogue so that we can possibly comply with wishes and ideas in our project proposal” (Hanghøj, 2023e). Thus, the energy companies also positioned themselves as engaging in a democratic dialogue with the citizens, and what was considered a democratic short-circuit by parts of the municipal council was instead argued to be of democratic value since it opened an early dialogue on the solar power plant, allowing citizens to influence the design of the plant.

The rationales in STI2 were closely related to the representation of actors and actions. One main rationale was the protection of local places of value due to qualities of nature, agriculture, or individual place attachment. A second main rationale was the democratic quality of the decision-making process. In the coverage, the rationales were mainly used to question or reject the solar facility plans, but it is worth noticing that they may lead to another conclusion as well. As mentioned above, the early engagement of citizens by the energy company can also be argued as positive from the democratic rationale.

While these rationales were prevalent in the *FD* coverage of the solar power plant, the rationales from STI1 on local cooperation towards green transition were not simply absent; they were referred to as well, but often in a concessive manner, by which they were acknowledged but at the same time presented as not at stake in the current situation. One example is a letter to the editor by two municipal politicians, which began by supporting the green transition and stating that a focus on green technology could develop into an “export adventure” (Vind & Olsen, 2023) for Fredericia. “Nevertheless”, the authors were sceptical regarding the specific solar facility plans with reference to the above rationale

of local scarce nature. This argumentative structure of “X but Y” (Fløttum & Gjerstad, 2017) allows for aligning with STI1 while at the same time representing it as less relevant for one’s decision on the current issue.

Finally, the local site qualities represented in the *FD* coverage did not fit well with the solar facility plans. For instance, in the headlines, the plant was referred to as a “giant solar park” (Hanghøj, 2023b) or “mega solar park” (Hanghøj, 2023d), and the size was said to correspond to “320 football fields” (Hanghøj, 2023b). This stood in contrast to often quoted remarks on the small size of the municipality and the scarcity of green areas, which, according to a municipal politician, should not be “plastered with” solar panels. Thus, whereas the local site qualities in STI1 were represented as well suited for developing a PtX infrastructure, they were viewed as threatened by the PtX related plans within STI2. Similarly, the optimistic vision of a future energy hub or PtX adventure for Fredericia was replaced by a more defensive tone, where concerns for losing existing local qualities were prevalent.

Discussion and conclusion

Sociotechnical imaginaries of PtX in the local news media

Concluding on the analysis with regards to research question 1, two different imaginaries can be observed in *FD*’s coverage of PtX; they differ significantly on all four discursive dimensions.

Concerning the societal problem definition, PtX emerges in STI1 as a partial solution to the problem of climate change due to the development of green fuels, whereas it is articulated as worsening the problem of scarce green areas in STI2, due to the land-consuming solar power plant. Both problem orientations are green, but in different ways and with conflicting outcomes for the local use of PtX. Correspondingly, the rationale of local growth and jobs in STI1 provides a different background for evaluating PtX than the rationale of nature protection and democratic dialogue in STI2. These rationales are not per se contradictory, but in the current case, they lead to different conclusions.

Concerning actions and actors, important shifts in agency between key actors such as energy businesses, municipalities, and citizens can be observed. The agency of citizens shifts from hardly present in STI1 to an influential force in STI2. However, the citizen agency is still reactive because citizens are represented as responding (emotionally) to plans that originate elsewhere. The energy businesses, on the contrary, possess high agency in both STIs, but in different ways. In STI1, they are depicted as initiators of innovative energy solutions of the future. In STI2, on the other hand, their efforts constitute a potential threat for the scarce green areas in Fredericia. Finally, the agency of the municipality changes as well. In STI1, the municipality is primarily ascribed a facilitating role for the business synergies on the pathway to a future PtX adventure, while in STI2, this is replaced by a more traditional role as a public authority, regulating the energy policy in the area. At the same time, this role comes across as challenged by the energy company initiatives.

Finally, concerning the qualities of the specific site made relevant for PtX, two different “place imaginaries” (Zoé et al., 2021) can be observed. STI1 is characterised by a focus on Fredericia’s central position in the national infrastructure and on the alleged unique mix of business capacities which would enable a future position as a PtX hub in Denmark. Quite to the contrary, in STI2, the qualities made relevant are not scaled beyond Fredericia, but concentrate on Fredericia as a densely populated and industrialised area with limited access to green areas. Thus, while the industry features of Fredericia provide an asset in STI1, they give rise to concerns in STI2. In that sense, only STI1 represents a “spatial transformation imaginary” with a narrative of a promising place change (Zoé et al., 2021). The two sociotechnical imaginaries are summarised in Table 2.

TABLE 2 Sociotechnical imaginaries in FD’s coverage of PtX

Discursive dimension	Sociotechnical imaginary	
	Local cooperation is crucial for green energy solutions (STI1)	Caring for our scarce green areas (STI2)
Societal problem	Climate change; development of climate-friendly fuels	The scarcity of land and green areas
Actors and actions	Cooperation and use of synergies between different energy companies, local municipalities, and institutions The municipality as facilitator	Conflicts between citizens and energy businesses The municipality as public authority
Rationales	Creation of local growth and jobs Mitigating climate change	Protection of local green areas Democratic dialogue
Relevant site qualities	Central position in national energy infrastructure Unique mix of business competences Chance to move from “black” to “green”	Access to nature and green areas in a densely populated area Risk of losing green qualities

It is important to note that the two STIs are not distributed randomly in the *FD* coverage. Quite the reverse, they seem to run on parallel tracks, depending on the specific thematic focus of the media coverage. Thus, when reporting on the hydrogen factory or on several other business initiatives related to PtX, STI1 is clearly prevalent. However, when it comes to the physical placement of electricity production for the hydrogen factory, a shift to STI2 as the dominant STI can be observed. In this shift, the rationales of STI1 are not opposed, but they are treated as less relevant for the current matter.

Widening the scope: Mediatised environmental conflicts

Turning to research question 2 on environmental conflicts, three key observations can be made on similarities with and differences to other conflicts related to the green energy transition.

First, a key difference from many other mediatised environmental conflicts (Hutchins & Lester, 2015) lies in the fact that not the “black” industry, but rather the “green” energy businesses, are engaged in the conflict. Thus, the environmental concerns raised in STI2 are not represented by *FD* as colliding with the interests of the fossil fuel industry, but with the interests of emerging climate-friendly businesses. In that way, the main conflict line in STI2 is an example of a green-on-green, or simply green, conflict (Eskjær & Horsbøl, 2023; Warren et al., 2005), where different environmental concerns collide, in casu concerns for local nature and for the global climate. These concerns are not as such contradictory, but they come across as pulling in different directions in the later stage of the media coverage. However, the conflict lines represented by *FD* are not only about environmental concerns, since rationales of job creation, economic growth, and democracy play a part too. In that way, the case illustrates how a green-on-green conflict can be co-articulated or overlaid with non-environmental concerns.

Second, it is worth noting that PtX is not made sense of as a green-on-green conflict from the very beginning of the news coverage. This points to the dynamics of the debate. Here, the concept of politicisation (Hay, 2007), in combination with the concepts of spheres of action and switching points (Hutchins & Lester, 2015), can be helpful in spelling out the conflict dynamics. In the first part of the debate, when STI1 is prevalent, the PtX issue is politicised to some extent as *FD* reports on disagreement within the city council. However, this plays a minor role in the coverage, related to the (reported) fact that only one city council member opposed the hydrogen factory plans. Instead, the PtX future is mainly represented as a win-win-win situation where local growth, job creation, and climate change mitigation go hand in hand, drawing primarily on sources from the spheres of market and formal politics.

This changes with the introduction of STI2, where the PtX issue is (re) politicised from the perspective of care for local green areas. In contrast to the previous politicisation within STI1, this politicisation does not result from reporting on controversies within a formal political arena (the city council), but from the local media providing a space for concerned citizens. Thus, the politicisation initiates outside the political system and is brought into a wider public sphere by the local media. The switching point for the mediatised conflict thereby moves from the intersection between the spheres of formal politics and the news media to the intersection between civil society and the news media. Moreover, the very occasion for the *FD* reporting was a meeting organised by an energy company for local citizens. Thus, the local media helps in politicising an issue that had otherwise, by the energy company, been treated as an issue to be settled between the energy company and the local citizens. In terms of Hay’s (2007) division of arenas for politicisation, the *FD* coverage thereby politicises

the issue by moving it from the private realm to the public sphere, that is, into an issue for public debate. Furthermore, it can be argued that the media also paves the way for (re)politicising PtX in the sphere of formal politics because the introduction of concerned citizen voices seems to prompt local politicians to take a renewed public stand, or to at least announce that such a stand will be taken.

This dynamic of one switching point to another, involving different intersections between media, market, politics, and civil society, as well as politicisation across the private, public, and (local) governmental realm, can of course not be generalised to other cases. But it illustrates the importance of accounting for the interplay between the different arenas and spheres of action for examining the specific dynamics of a mediated environmental conflict, including the distinctive role of the (local) news media in the process.

Furthermore, it can be argued that a condition for the conflict dynamic in the current case is the optimistic win-win-win imaginary in STI1. Though STI1 emphasises synergies and cooperation, it does not incorporate the (STI2) green concerns for local nature at all. In STI1, PtX is not framed as a partial solution to the “wicked problem” of climate change (Brown et al., 2010), which would have invited complex understandings and unfinished negotiations between different concerns. Instead, the win-win-win perspective makes STI1 more vulnerable to criticism on the rather basic issue of local land use for electricity production.

Third, it is striking that although PtX represents a new technology, the two dominant STIs show significant similarities to debates on forms of energy transition with other technologies. As for STI1, this represents an optimistic imaginary where climate mitigation, technological development, and economic growth go together. Apart from being an example of the broader discourse of ecological modernisation (Hajer, 1995) and for resonating with the high hopes expressed for PtX in Denmark by expert stakeholders (Skov et al., 2021), STI1 is also characterised by emphasising the distinctive qualities of the local area of Fredericia or the Triangle region for becoming a forerunner in the green energy transition. However, this feature is not specific to PtX, but can be found elsewhere in discourses on green energy transition, both locally and nationally. For example, in a recent study of sociotechnical imaginaries on energy transition in Portugal, Carvalho and colleagues (2022) identified imaginaries on “Green Economy” and on “Modernization and Techno-Economic Development”, where Portugal is positioned at the potential forefront for the energy transition, due to both natural resources and political vision. This future forerunner position, again like the current case, would revert existing geopolitical patterns, and it thereby provides an attractive spatial transformation imaginary (Zoé et al., 2021) for an otherwise less privileged area. Thus, somewhat paradoxically, the idea of being uniquely equipped for taking on a leading role in the green energy transition seems to be widely distributed, also across different energy technologies.

As for STI2, it is equally striking that it is not the application of the particular PtX technologies (e.g., the production of hydrogen and the associated risks) that triggers the mediated environmental conflict. Instead, it is the rather basic question of land use – that is, not the underlying energy technology, but the use

of green areas as a perceived scarce resource – that is the crux of the matter. Therefore, the conflict resembles a range of other green conflicts over land use, including the broadly studied conflicts over placement of wind turbines (Horsbøl, 2020; Kirkegaard et al, 2021; Rand & Hoen, 2017). The representation of local citizens in a reactive position as emotionally affected citizens also fits into this picture. Citizens thereby come to play a role as defenders of the status quo, rather than as contributors to novel green imaginaries.

Finally, the current study is only a single case study at an early stage of the public debate on PtX. To mention but a few suggestions, future research may study 1) whether similar sociotechnical imaginaries are employed in the media representation of PtX or other new energy technologies at other locations, 2) how politicisation dynamics unfold with the news media in a key position vis-à-vis civil society, the market, and formal politics, 3) whether discursive patterns known from other forms of energy transition continue to be significant, and 4) how different voices contribute to and are positioned in the public emergence of green imaginaries, including how more defensive and more visionary roles are distributed as environmental conflicts play out.

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