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Opinion

Towards More Nuanced Narratives in Bioeconomy Strategies and Policy Documents to Support Knowledge-Driven Sustainability Transitions

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Academic Editor: Jan Hopmans

Received: 30 June 2025
Revised: 1 September 2025
Accepted: 17 September 2025
Published: 24 September 2025

Citation: Stoye, J.; Schlaile, M.P.; von Cossel, M.; Bertacchi, S.; Escórcio, R.; Winkler, B.; Curran, T.P.; Ní Chléirigh, L.; Nic an Bhaird, M.; Klakla, J.B.; et al. Towards More Nuanced Narratives in Bioeconomy Strategies and Policy Documents to Support Knowledge-Driven Sustainability Transitions. *Sustainability* **2025**, *17*, 8590. https://doi.org/10.3390/su17198590

Abstract

The bioeconomy has been discussed as a key strategy for addressing sustainability challenges, particularly regarding the transition from fossil-based to bio-based systems, in numerous national and supranational strategies and policy documents related to the bioeconomy. However, public understanding of and engagement with the bioeconomy remains limited. This is partly due to the bias of many bioeconomy strategies and policy documents towards technological solutions that tend to overlook the social, normative, and transformative dimensions of systemic change as well as the necessary knowledge. This opinion paper explores the potential of narratives as a means of communicating bioeconomy research in public policy, with the aim of addressing the communication gap between science, policy, and society. When applied in responsible and nuanced ways that acknowledge their embeddedness and context, bioeconomy (policy) narratives can support sensemaking for science communication, improve public understanding, facilitate stakeholder engagement and behavioural change. We argue that such narrative approaches can help to create narrative 'boundary objects' that can support more inclusive and participatory processes, enabling the co-creation of transformative knowledge for bioeconomy transitions with stakeholders as active participants. In summary, we highlight several opportunities, as well as limitations and implications, that could inform future work on bioeconomy narratives.

Keywords: bio-based systems; bioeconomy; policy; narratives; societal transition; science communication; stakeholder engagement; transformative knowledge

1. Introduction: Revisiting the Bioeconomy Communication Challenge

The bioeconomy has been discussed for years as a promising response to global sustainability challenges such as the climate crisis [1]. However, despite increasing efforts to raise global awareness, the bioeconomy has not been able to fully deliver on its promises [2]. For the general audience, that is, various societal stakeholders, the bioeconomy largely remains an unclear and abstract concept that does not directly relate to their daily lives (e.g., for Germany, see [3]), despite growing political awareness and increasing scientific research [4]. In that regard, although the transformation from a fossil-based to a bio(-based) economy is often framed as a knowledge-driven endeavour (e.g., [5,6]), the type(s) of knowledge required for such systemic changes, beyond new technological or scientific solutions, seem to remain insufficiently recognised [7–11]. In addition to new forms of innovation, multi-stakeholder cooperation, changes in our markets, technologies, (agro)ecosystems, consumer behaviour, and policies, we also need different forms of systemic, normative, and transformative knowledge to achieve societal transitions towards a sustainable bioeconomy [8,11–14]. Such fundamental sustainability-oriented changes, which also require changes in worldviews and cultural practices, cannot be facilitated or organised in a (solely) top–down manner [15]; it is also of paramount importance for all of us to change our behaviour as individuals, communities, and societies. In other words, transitions towards more sustainable and bio-based economies are collective endeavours that imply a shared responsibility and (systemic) agency of all stakeholders, ranging from public sector actors and companies to innovative citizens and consumers [16–18]. To fulfil their (share of) responsibility, however, they all require adequate political and societal structures that provide education, transparent information, institutional support, and reliable regulatory frameworks, among others. In this regard, effective communication between these different stakeholder groups is crucial. As, for example, Giurca [4] (p. 1227) states: "Effectively building communication bridges between science, policymaking, and society is paramount for a successful circular bioeconomy transformation".

Against this background, building these effective communication bridges for the bioeconomy presents a complex challenge that needs to be addressed specifically. As described by Bugge et al. [1], Vivien et al. [19], Hinderer et al. [20], and various others, there is still no consensus on what the bioeconomy actually means (e.g., how it envisages the relationships between social, economic, and ecological systems), and there are multiple (often conflicting) accounts, perspectives, stakeholders, and disciplines involved (e.g., [21–27]). This is also reflected in many different conceptualisations, narratives, discourses, and visions of the bioeconomy, some of which have been argued to contradict the original ideas of the *bioeconomics* of Georgescu-Roegen (e.g., [19,28,29]). For example, according to Bugge et al. [1], three ideal-typical bioeconomy visions can be distinguished, reflecting different narratives as further elaborated and analysed by Vivien et al. [19]:

- A *biotechnology vision* (e.g., striving for new biotechnological research, application, and commercialisation);
- A *bioresource vision* (e.g., striving for upgrading and conversion of natural resources and new value chains through research, development, and demonstration, also driven by biotechnology); and
- A *bioecology vision* (e.g., striving for circular processes and considering ecosystems and society).

For the European Union (EU), the biomass or bioresource-based bioeconomy has been the dominant narrative [2,19,30], which is currently reiterated in official statements: "The bioeconomy includes biomass production, biomass conversion into food, materials and products, and bioenergy. The bioeconomy is essential for the EU to reach its climate and energy goals by 2030 and climate neutrality by 2050, while combating biodiversity loss and pollution" [31]. However, it is notable that even within the EU's official (updated) Bioeconomy Strategy from 2018 [32] and the Progress Report from 2022 [33], Zepharovich and colleagues identified nine different narratives with distinct problem framings, assumptions, claims, and promises regarding the bioeconomy [34].

Looking at the global bioeconomy narrative, Proestou et al. [35] studied 78 bioeconomy strategies and policies from 50 countries around the world and analysed them according to different categories. One finding that resonates with other studies is that "the bioeconomy discourses and policies have not paid enough attention to issues of social inclusion, societal dialogue, and social innovation" [35] (p. 388). Instead, communication on bioeconomy transitions or transformations has so far been biased towards techn(olog)ical and economic solutions, mostly driven by (bio)techno-economic knowledge [7,9,10,23,29,35]. However, Georgescu-Roegen already stated that an increasing dependence on and "addiction" to technological innovations are not the solution but will lead to further problems [29,36]. Arguably, this techno-economic bias is also reflected in the national and supranational bioeconomy-related strategies and policy papers that have been pursued by almost 60 countries [37,38].

When communicating about the bioeconomy, it is also important to bear in mind that stakeholders have different levels of knowledge about the bioeconomy, making it difficult to address each stakeholder group individually [4]. For example, a study by Dallendörfer et al. [39] in Germany shows that while citizens appreciate the underlying ideas of a new and sustainable economy, the overall concept of the bioeconomy remains ambiguous, which needs to be considered in strategic communication and policy design. Relatedly, based on a case study from Ireland, Faulkner et al. [40] emphasise the importance of adapting bioeconomy policies to local circumstances and contexts, especially when addressing and striving to engage different stakeholders. In this connection, it should also be acknowledged that citizens rarely read bioeconomy strategies and policy documents directly. Therefore, the media (including public and private media service providers) is a key stakeholder in shaping the narrative around these documents. The media can influence public understanding of and response to phenomena such as sustainability or bioeconomy and can be seen as an important arena in which competing policy narratives are presented [41,42].

Generally, bioeconomy communication targets not only citizens but also decision-makers and the corporate world in order to achieve systemic change(s) [4]. That said, the reception processes of narratives and media may strongly differ between target groups and audiences from diverse (socio-)cultural backgrounds (e.g., [43,44]), which underscores the importance of adapting bioeconomy (policy) narratives to different cultures and bodies of knowledge in society. Notably, highlighting the importance of narratives, a recent report by colleagues from the European Commission's Joint Research Centre [45] examines the use of quantitative storytelling and narrative methods as important tools for integrating different stakeholder perspectives and complex sustainability criteria into the assessment of land use in the bioeconomy and into political decision-making processes. The authors of the report also emphasise the pivotal function of narratives in the development of alternative future visions and the facilitation of inclusive discourse [45].

With this opinion paper, we contribute to these ongoing debates by highlighting the importance of narratives and narrative approaches in the context of bioeconomy science

communication and policies. Although this is not a research article, it can also be understood as a result of a (interactive) reflexive methodology (e.g., [46,47]) and an accompanying (narrative) literature review (e.g., [48]) conducted by the authors based on their prior knowledge and engagement with bioeconomy topics—especially in connection with debates that originally emerged in the context of the BioBeo EU project consortium supported by the EU Bioeconomy Youth Ambassador Programme.

Therefore, the primary target group we aim to reach with this opinion paper includes bioeconomy researchers, policy-makers, and science communicators with a particular focus on the science–policy–communication nexus. This focus has emerged from debates among the authors and with other colleagues and should not downplay the role of corporate communications or non-governmental organisations in the co-creation of bioeconomy policies and narratives, which warrants a separate treatment.

In the context of a normative orientation towards societal transformation towards a sustainable bioeconomy, our key arguments for a more nuanced approach to narratives in bioeconomy strategies and policy documents can be summarised as follows:

- *Bioeconomy communication challenge:* The narrative focus of current bioeconomy (policy) communication has side-lined social inclusion, considerations of justice and responsibility, stakeholder dialogue, and participation as well as other forms of (social and transformative) innovation beyond new technologies (e.g., [2,35,49]).
- *Epistemic limitations:* Systems knowledge, normative knowledge, and transformative knowledge types that can drive behavioural and cultural changes at the individual, community, and societal levels have been neglected in comparison with techno-economic knowledge (e.g., [8–11]).
- *Competing bioeconomy visions:* There is no consensus on what the term 'bioeconomy' means (e.g., [21–26]). This can create various conflicts between narratives, visions, and interests of bioeconomy stakeholders, potentially undermining effective communication and (transdisciplinary) collaboration.
- *Bias towards technological fixes:* Policies and strategies often continue to focus on techno-economic frameworks and solutions. This means they pay insufficient attention to the complexity of the normative dimensions of transformations towards sustainability. This results in an inadequate focus on processes and platforms that facilitate participation, stakeholder dialogue, and inclusion. These processes and platforms should also facilitate the exnovation and phase-out of unsustainable and unjust structures and practices (and the corresponding narratives) (e.g., [2,8,9,49,50]).
- *Developing more nuanced (understandings of) bioeconomy narratives:* Narrative approaches can offer ways of translating abstract concepts into meaningful and comprehensible stories, thus connecting political visions with lived experiences. We thus call for greater recognition and a more nuanced treatment of narratives at the intersection of bioeconomy policy, science, and communication.

In the following Section 2, we highlight the power of narratives for bioeconomy science communication before turning to the role of narratives at the science–policy interface in Section 3. In Section 4, we highlight the merits of using 'what,' 'how', and 'why' questions to develop more nuanced bioeconomy (policy) narratives before we conclude this article in Section 5 with some reflections on what will probably be the most pressing question for readers of this article: 'so what?'

2. The Power of Narratives Is Key for Science Communication in General and Bioeconomy Communication in Particular

At the heart of our social life is the storyteller or "*homo narrans*" [51], and narratives are seen as a form of meaningful communication connecting individuals, cultures, and

societies [52,53]. Narratives have been around for as long as humanity and have been the focus of research from various disciplines. Although there is no universally applicable definition of narratives (e.g., [54–57]), they are generally associated with storytelling and testimonies that (re)present relationships between (series of) events, individual experiences, characters (e.g., the narrator or 'hero' of the story) and plot [54,58–61]. Jones and McBeth [62] (p. 329) offer a definition that captures the functional elements of narratives as both a way of communicating and a method of cognitive organisation: "A narrative is a story with a temporal sequence of events unfolding in a plot that is populated by dramatic moments, symbols, and archetypal characters that culminates in a moral to the story". As an important narrative component, plots structure the relationships between elements such as characters and settings, and they shape causal explanations that make a narrative plausible [63]. Dobroć et al. [64] (p. 2) clarify that narratives represent or reflect "a strategy that lies behind the story, the way how the elements of the story are interconnected but the strategy is not the same as the motivation or intention of the author(s) of the story".

Regarding science and science communication quite generally, Mendelsohn [65] (pp. 3–4) states that science "is an activity of human beings acting and interacting, thus a social activity. Its knowledge, its statements, its techniques have been created by human beings and developed, nurtured and shared among groups of human beings. Scientific knowledge is therefore fundamentally social knowledge." Scientists are often investigating processes and producing data that are too abstract for other societal stakeholders to understand. To tackle issues such as climate change and to recognise the bioeconomy as part of an array of viable solutions, we will thus need to find a way of connecting robust scientific findings to the lived experiences and individual perceptions of the phenomena in question that inform decision-making. Dahlstrom [60] points out that the further research results deviate from the human scale and cognitive processes that facilitate practical interaction with the environment, the more abstract the perception of unintuitive phenomena such as climate change (or the bioeconomy, for that matter) will become.

Therefore, researchers, policy-makers, and (science) communicators, particularly with regard to contested concepts such as sustainability and bioeconomy, should pay more attention to the empirical evidence showing that narratives can facilitate information processing, help organise and communicate information, and add value and emotional impact to the information provided (e.g., [55,56,62,66,67]). Hereby, narratives can enable critical thinking as well as inform and challenge audiences [68]. However, it is important to note that, while narratives can be a powerful sensemaking device (e.g., [69]), they need to be approached carefully and in nuanced ways, as different communities and levels of knowledge require different approaches [55,64]. This is partly due to the cultural and regional embeddedness of narratives and related (bio)economic visions (e.g., [29,70,71]). Research has also highlighted the important connection between narratives and emotions, which can have a significant impact on the selection of and engagement with certain messages and discourses (e.g., with regard to climate change [72]), thus also influencing their persuasive impact [73]. It is, therefore, evident that those in positions of authority and power can utilise such mechanisms to exert influence over attitudes and behaviours by employing emotional engagement and storytelling techniques [73]. Narratives can thus be a double-edged sword in general as they have frequently been employed for manipulative and coercive purposes as well as to disseminate misinformation, disinformation, and propaganda (e.g., [74,75]).

When considered in nuanced and critical ways, the presumed educational benefits of narratives can make them an attractive means of collective sensemaking at the science–policy–communication nexus of the bioeconomy, as narratives can help to capture the imagination of the audience and inspire interest and involvement in science [76]. They may

thus offer a potential means to the end of making sense of complex and rather cognitively distant scientific topics, bringing them back to the human scale and relating them to our own experience [77]. However, Katz [78] cautions against unsubstantiated or manipulative narratives and argues that the narratives being used in science communication should be based on scientific models and evidence and be used carefully. Nevertheless, even when narrative approaches in science communication are backed by models, evidence, or data and employed carefully, there is also always a risk of these narratives contradicting each other or oversimplifying complex issues, especially in the context of a (sustainable) bioeconomy, given the multiple bioeconomy visions and (normative) agendas involved (again, see [1,19–25]).

Given that narratives can be designed or framed to help people understand, enhance recollection and interest, and make sense of the information provided (e.g., [76,79]), we argue that there is merit in focusing more on the (context-sensitive and often place-specific) role and (performative and sensemaking) power of narratives (e.g., [71]) for generating and communicating the various types of knowledge relevant for sustainability-oriented bioeconomy transitions and transformations. In particular, when communicating with non-expert audiences, the distinctive features and dynamics of narrative patterns and (discursive) lock-ins should not be ignored [80,81]. Many bioeconomy narratives currently also seem to lack (dedicated) roles for certain groups of actors, such as citizens or consumers as co-creators of a sustainable bioeconomy (e.g., [16,17]). This could challenge the legitimacy of the bioeconomy and, consequently, its future prospects [42,49]. Therefore, to use narrative approaches effectively and responsibly, communicators may need what could be called *narrative literacy* (akin to media literacy or digital literacy) to carefully choose how and when to use which narrative(s) to help audiences make sense of the complex scientific issues related to sustainability and bioeconomy. Arguably, such narrative literacy also calls for more (interactive) reflexivity (e.g., [46,47]) with regard to potentially problematic epistemic hierarchies and power relations between 'experts' (e.g., bioeconomy researchers and policy-makers) and 'laypeople' (e.g., societal stakeholders such as students, citizens, consumers, etc.).

3. Bridging the Gap Between Research and Policy-Making with Narrative Contributions to Bioeconomy Strategies

Different countries have deployed different bioeconomy strategies based on their resources and historical industry structures and innovation systems, resulting in varieties of bioeconomies [82]. As Viaggi [83] also elaborates, there is no 'one-size-fits-all' solution but a strong dependence on context-specific innovation systems and links to research. As already highlighted in Section 1, successful bioeconomy policies and strategies thus involve more than technical or sectoral changes: they require the development of engaging narratives and visions for the management and integration of living organisms and biological resources across the respective societies and regions. Policies supporting bioeconomy transitions thus rely on transition narratives that go beyond economic incentives in order to foster public understanding and engagement, professional support, awareness, and a shared purpose [83]. As we have argued in the previous section, narratives are essential for our communication in general but also for communicating complex and contested issues, such as the bioeconomy and sustainability, that span across multiple fields and knowledge types. It is, therefore, unsurprising that the use and study of narratives have a long history in public policy (e.g., [84]). Narratives have been acknowledged as important for policy as they can engage and persuade both decision-makers and general audiences and are central to all stages of policy processes (e.g., [67,85]). They are also recognised as crucial to information processing and sensemaking (e.g., [69]) and are thus taken seriously by researchers

and policy-makers to engage citizens and legitimise policies [62,86]. In this regard, for example, the aforementioned case study of the Irish bioeconomy by Faulkner et al. [40] uses a narrative approach to conclude that adapting the (narratives of) EU bioeconomy ambitions to local circumstances and contexts can help to promote policy coherence and strengthen the acceptance and participation of local stakeholders. Relatedly, such regionally embedded narratives may also serve as inspirational stories for policy learning and coordination between bioeconomy strategies and policies at the supranational (e.g., EU), national, and regional (e.g., state or even municipal) levels and help to create or increase legitimisation for regional bioeconomy innovations and transitions (e.g., [49]).

However, it is not only important to recognise the place specificity of bioeconomy policy narratives, but it is also vital that they are appropriate for different societal and stakeholder groups. For example, bioeconomy narratives can arguably play an important role in the communication about sustainability-oriented innovations such as bio-based products. This is particularly important given that their adoption and diffusion often depend heavily on consumers' perceptions, knowledge, values, and worldviews, among other factors [87]. As this latter aspect is also closely related to marketing and corporate communications, it should be discussed in more detail elsewhere. For now, it must suffice to say that narratives concern and pertain to multiple levels of social and economic systems.

In light of these multi-layered consequences, scholars such as Luederitz et al. [88] and D'Amato [89] argue that a deeper and systemic recognition and integration of narratives of transition and sustainability can support lasting systemic transformation (relatedly, see [57,90]). Here, however, it is important to account for the (in)compatibility between narratives. For instance, the combination of different sustainability narratives (of the economy), such as the circular economy and the bioeconomy, may better help to catalyse sustainability transitions and social–ecological transformations if these narratives exhibit complementarity and synergy and if they are adapted to diverse contexts, actors, and audiences [89].

Yet, as already indicated in Section 2, the role of narratives in policy is also a controversial topic, especially with regard to their framing (e.g., [75,91,92]). Depending on the policy context, manipulative and strategically framed narratives can either threaten democratic participation or become a legitimate part of the democratic process (e.g., [53,85]). The empirical investigation of how policy narratives influence individuals and groups, and their impact on policy development and implementation, is becoming an increasingly popular area of research within policy studies more broadly [93] as well as in the context of bioeconomy policies more specifically (e.g., [22,34,70,92]). Nevertheless, there is always a danger in the use of narratives that evidence-based policy-making becomes policy-based evidence-making [94]. In addition, it is also inherently challenging to assess the impact of narratives on policy outcomes. Focusing on narrative elements does not provide obvious ways of assessing how these narratives lead to actual policy changes or shifts in public opinion. This complicates efforts to capture the effects of narrative interventions [95].

The way topics such as the bioeconomy are presented and framed can either legitimise or delegitimise related policy measures and influence associated practices. Hence, these narratives are constructed by actors with different ideas about *how* best to achieve a transition to a sustainable bioeconomy and *who* (which societal actors) should be involved and can support and shape policy design [3,42]. Policy-makers are generally expected to communicate clear answers to challenges, whereas researchers often describe complex processes and outcomes, as well as the shortcomings of their studies and the need for further research. In addition, depending on the discipline, researchers might have limited policy knowledge, insufficient training, and little experience in communicating with policy-makers [96]. Relatedly, Epstein et al. [97] argue that there is a fundamental disconnect between policy-makers and their audience, especially if policy-makers would like to foster

meaningful citizen engagement, including participatory processes, to bridge the conceptual gap between experts and other stakeholders in accordance with the narrative literacy discussed at the end of the previous section. Hence, to overcome this disconnect, the narratives used by the science–policy–communication nexus must account for *situated knowledge* [98] to create meaningful policies, translate between different knowledge types, and provide guidance with reference to real-world impacts and events [97]. Arguably, bioeconomy (policy) narratives that relate to situated knowledge(s) can also help to increase sensitivity for other bioeconomy stakeholders and, eventually, a better understanding of their different bioeconomy visions (again, see [1,19,20]), and orientations of the bioeconomy [99], as these visions reflect the "collective imaginary or shared understanding of the concept of bioeconomy by a group of actors" [14] (p. 681).

To seize political opportunities for sustainability-oriented bioeconomy transitions, it is often necessary to rapidly translate relevant research findings into narratives suitable for policy and strategy papers [85,96]. Here, however, it is imperative to acknowledge the associated (transition) tensions (e.g., between urgent top–down regulation and more time intensive bottom–up participation, see [100]) as well as the potential for a multitude of pathways and solutions that incorporate and recognise the different values, perspectives, and worldviews of a diverse range of stakeholders [15,89] and their particular regional contexts [26,49,70,71].

4. What? How? Why? Navigating Narrative Diversity Through 'Boundary Objects'

Navigating such plurality and diversity in bioeconomy policy and (strategic framing of) bioeconomy narratives is a daunting task that is closely connected to broader academic and policy debates of directionality as part of the normative dimension of systemic transformations (e.g., [50,101]). More precisely, this literature often revolves around questions of *what, why, by, for, and to whom, how,* etc., which have also been highlighted by other colleagues, including the adjacent literature on communication challenges in the bioeconomy by Giurca [4] and the work on narratives of change by Wittmayer and colleagues [102], to name but a few. Hence, given that the 'what' and the 'why' of the bioeconomy policy process are already difficult to answer unambiguously, it is understandable that the framing and communication of bioeconomy (policy) narratives is a controversial issue and that "calls for better communication are too simplistic" [4] (p. 1226). In line with the recent literature on directionality and (mission-oriented) innovation policy, it could, therefore, be worthwhile to consider bioeconomy (policy) narratives as a form of "boundary object" (e.g., [103,104]), which can enable engagement from a variety of stakeholders with diverse but often complementary (techno-economic, systems, normative, and transformative) knowledge.

As already noted in the introduction, bioeconomy strategies and policy documents (which often aim to answer 'how' questions) are addressed to a variety of stakeholders ('to whom') and provide a framework—especially in the sense of a possibility space—for promoting public engagement and participation of those stakeholders ('by and for whom'). The approach of asking 'what', 'how', and 'why' questions (Figure 1) was also used in the BioBeo EU project to analyse existing definitions of the bioeconomy in the literature with the aim of developing a comprehensive definition targeted at schoolchildren of different age groups, for use in teaching materials [105]. Figure 1 thus provides a schematic overview of different aspects that can serve as starting points when answering what, why, and how questions about bioeconomy policy processes based on findings from the BioBeo project and the type of interactive reflexive methodology employed in this article. Therefore, the

aspects depicted in Figure 1 are intended to inform and inspire further debates and research, but they should by no means be considered exhaustive or applicable in all contexts.

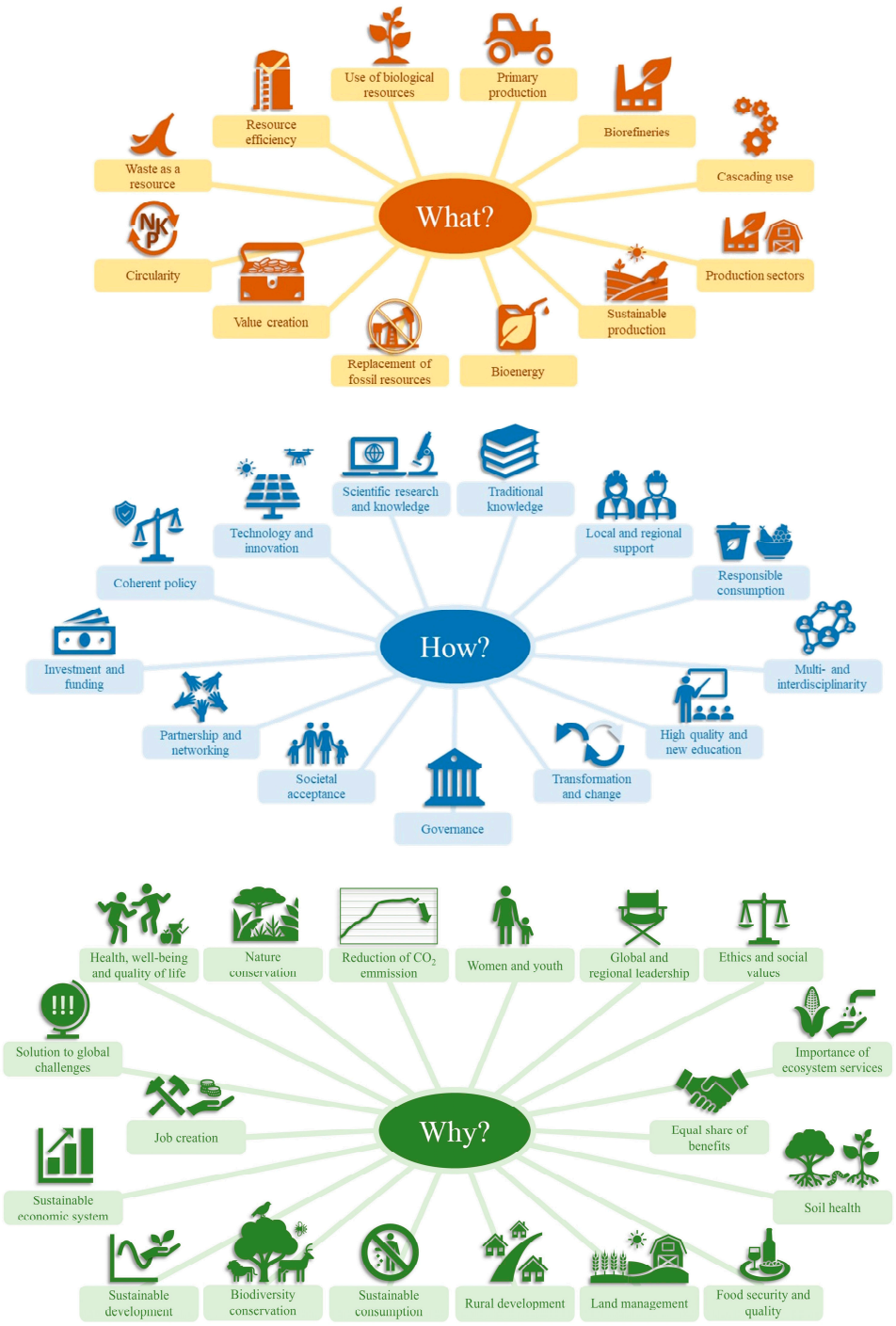

Figure 1. Schematic overview of aspects that can serve as starting points or 'boundary objects' when answering the "*what, how, and why*" questions of bioeconomy policy processes and their respective narratives. Source: Own representation based on BioBeo EU project findings and discussions.

5. So What? Concluding Remarks and Implications

In summary, bioeconomy strategies and policy documents *can* provide various narrative boundary objects (e.g., framed around the what, how, and why questions) that offer different opportunities and pathways for societal stakeholders to change behaviours and reduce dependence on fossil resources (relatedly, see [104]). Such narratives have the potential to improve communication about the bioeconomy between stakeholders,

thereby encouraging engagement with it. They can also help to envision more sustainable ways of living [106] and desired system changes by creating social meaning in policy [90]. We thus agree with other colleagues who have called for narratives to be taken more seriously and claim that they can indeed help to co-create transformative outcomes for a more sustainable and just bioeconomy where no one is left behind. Despite such potential, however, when considering the use of such narrative boundary objects at the science–policy–communication nexus of the bioeconomy, it must be kept in mind that narrative approaches entail risks, as discussed above, and could also lead to oversimplifying multifaceted policy issues, potentially obscuring their underlying complexities and nuances (either deliberately or unwittingly). Such oversimplification (see [73]) can result in the promotion of one-size-fits-all policy measures and interventions that are inadequate or misaligned with the sustainability challenges bioeconomy strategies and policies aim to tackle. Ultimately, storytelling and narrative approaches are not a panacea, but their transformative potential (for better or worse) deserves more committed and nuanced consideration. We therefore conclude this opinion paper with a non-exhaustive selection of potentially promising approaches and questions for future work to be addressed by bioeconomy researchers, policy-makers, and communicators (e.g., journalists):

- The attractiveness, selection, and persuasive impact of narratives have been found to be strongly connected to emotions (e.g., [73,107]), which have also been argued to play a key role in sustainability transitions (e.g., [108]), not least when actors are faced with (often inevitable) phase-outs and "transition pain" [109]. We thus call for research focusing on the interplay between emotions, bioeconomy narratives, and the creative and destructive (e.g., innovation vs. exnovation) sides of sustainability transitions.
- Given the methodological challenges of assessing the impact of narratives on policy outcomes, focussing on narrative elements may not offer unambiguous ways of capturing how narratives lead to actual policy changes or shifts in public opinion, which complicates efforts to monitor and evaluate narrative approaches and interventions [95]. Further research is needed, therefore, to improve policy monitoring and evaluation of narrative approaches in bioeconomy strategies and policy documents.
- As the bioeconomy is an interdisciplinary and transdisciplinary endeavour, problematic epistemic hierarchies and lock-in into the 'monocultures' of a single discipline can hinder the collaboration necessary for co-creating bioeconomy narratives. Scientists often struggle to communicate effectively not just with policy-makers or 'laypeople' but even with other scholars (especially those outside their own field or discipline), which creates challenges for the co-creation and integration of knowledge [110] as well as the societal uptake of narratives. Consequently, there is a need for investigations into successful institutional reforms that can better support and incentivise transdisciplinary research in sustainability and the bioeconomy.
- As highlighted by various authors, successful bioeconomy transitions require public understanding and engagement, professional support through intermediaries, awareness of a shared responsibility, and a common dedication and purpose, as technological promises and economic incentives alone will be insufficient and potentially unsustainable (e.g., [49,83,111]). Therefore, narratives are no panacea for sustainability transitions, and narrative approaches to bioeconomy policy will always be interdependent with the diversity of stakeholders' perspectives and opinions, political preferences and ideologies, media interpretations, current research data, and societal as well as economic incentives, to name but a few. Therefore, investigating the interplay between public opinion dynamics, voting behaviour, and the legitimacy and adoption of bioeconomy policies and strategies represents another relevant avenue for future work. Here, it would be equally important to examine whether and to what

extent there are narrative patterns among societal groups and other stakeholders, and how subsidies, dedicated funding schemes, and regulatory incentives influence the prevalence and diffusion of such narrative patterns.

- Accordingly, policy-makers should strive for narrative frameworks that are sensitive to the complexity of sensemaking and the normative dimensions of transformations, also taking into account potential lock-ins and counter-narratives emerging from dominant (e.g., neoliberal) economic paradigms and discourses (e.g., [19,89,90]). This calls for establishing more dedicated platforms for participation and co-creation with citizens and other stakeholders, fostering bottom–up processes and communication among the different stakeholder groups that share responsibility and agency for sustainability transitions. Acknowledging and facilitating consumer responsibility is just one example here (e.g., [16,17,87]). The details of how such platforms can and should be designed and operated remain a task for future work.
- It is evident that those in positions of authority and power, such as policy-makers, can use narratives to influence attitudes and behaviours by employing emotional engagement and storytelling techniques (see also the first bullet point on emotions). In line with the notion of narrative literacy and reflexivity discussed above, we therefore call for the use of nuanced, inclusive, and participatory narratives in bioeconomy policies and strategies that do not perpetuate existing inequalities and power relations.
- The media shares a significant part of the responsibility for framing public policy issues, influencing public perception and discourse. Thus, they also take part in shaping collective sensemaking and amplifying narratives and counter-narratives regarding (the translation of) bioeconomy policies. At the same time, the media can hold policy-makers, industry, and science accountable (e.g., [41,42]). This underscores the importance of 'narrative literacy' as part of the shared responsibility in bioeconomy transitions. We thus appeal to the media to take their responsibility for co-creating and disseminating inclusive, participatory, and critical narratives seriously to help overcome the bioeconomy communication challenges discussed above.
- Bioeconomy narratives may serve as 'boundary objects' that facilitate communication and coordination between diverse stakeholder groups such as policy-makers, scientists, industry, and society. Such boundary objects (e.g., framed around what, how, and why questions) may allow various groups to align their objectives while maintaining their distinct perspectives and diverse interpretations (see [103,104]). We thus encourage more engagement with the idea of boundary objects in the bioeconomy, being particularly mindful about how power relations influence the directionality of bioeconomy transitions.

Author Contributions: Conceptualisation, J.S., M.P.S. and E.R.; methodology, E.R.; investigation, J.S. and M.P.S.; validation, E.R.; resources, J.S., M.P.S., M.v.C. and E.R.; writing—original draft preparation, J.S. and M.P.S.; writing—review and editing, J.S., M.P.S., M.v.C., S.B., R.E., B.W., T.P.C., L.N.C., M.N.a.B., J.B.K., P.N., H.C., E.R., I.L. and P.S.; visualisation, M.v.C.; supervision, E.R. and I.L.; project administration, E.R.; funding acquisition, T.P.C. and E.R. All authors have read and agreed to the published version of the manuscript.

Funding: This work was supported by the Innovative Education for the Bioeconomy (BioBeo) EU Horizon project [grant agreement ID: 101059900], funded under Programme: Food, Bioeconomy Natural Resources, Agriculture and Environment. Moreover, Michael P. Schlaile acknowledges partial funding from the following sources that enabled his contribution: junior research group "BioKum", BMBF (031B0751), and the "CULEST" project, DFG (554256072).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: No new data were created or analysed in this study.

Acknowledgments: We have benefited from exchanges and interactions with numerous colleagues as well as former employees of the BioBeo EU project and the constructive comments of four anonymous reviewers that have shaped the evolution of this opinion piece.

Conflicts of Interest: The authors declare no conflicts of interest. The funders had no role in the writing of the manuscript or in the decision to publish this opinion piece.

References

1. Bugge, M.M.; Hansen, T.; Klitkou, A. What Is the Bioeconomy? A Review of the Literature. *Sustainability* **2016**, *8*, 691. [CrossRef]
2. Eversberg, D.; Koch, P.; Lehmann, R.; Saltelli, A.; Ramcilovic-Suominen, S.; Kovacic, Z. The More Things Change, the More They Stay the Same: Promises of Bioeconomy and the Economy of Promises. *Sustain. Sci.* **2023**, *18*, 557–568. [CrossRef]
3. Lühmann, M.; Vogelpohl, T. The Bioeconomy in Germany: A Failing Political Project? *Ecol. Econ.* **2023**, *207*, 107783. [CrossRef]
4. Giurca, A. Why Is Communicating the Circular Bioeconomy so Challenging? *Circ. Econ. Sustain.* **2023**, *3*, 1223–1232. [CrossRef]
5. Dabbert, S.; Lewandowski, I.; Weiss, J.; Pyka, A. (Eds.) *Knowledge-Driven Developments in the Bioeconomy: Technological and Economic Perspectives*; Springer: Cham, Switzerland, 2017; ISBN 978-3-319-58373-0.
6. Pyka, A.; Prettner, K. Economic Growth, Development, and Innovation: The Transformation towards a Knowledge-Based Bioeconomy. In *Bioeconomy—Shaping the Transition to a Sustainable, Biobased Economy*; Lewandowski, I., Ed.; Springer: Cham, Switzerland, 2018; pp. 331–340, ISBN 978-3-319-68152-1.
7. Andersson, I.; Grundel, I. Regional Policy Mobilities: Shaping and Reshaping Bioeconomy Policies in Värmland and Västerbotten, Sweden. *Geoforum* **2021**, *121*, 142–151. [CrossRef]
8. Urmetzer, S.; Schlaile, M.P.; Bogner, K.; Mueller, M.; Pyka, A. Exploring the Dedicated Knowledge Base of a Transformation towards a Sustainable Bioeconomy. *Sustainability* **2018**, *10*, 1694. [CrossRef]
9. Bogner, K.; Dahlke, J. Born to Transform? German Bioeconomy Policy and Research Projects for Transformations towards Sustainability. *Ecol. Econ.* **2022**, *195*, 107366. [CrossRef]
10. Urmetzer, S.; Lask, J.; Vargas-Carpintero, R.; Pyka, A. Learning to Change: Transformative Knowledge for Building a Sustainable Bioeconomy. *Ecol. Econ.* **2020**, *167*, 106435. [CrossRef]
11. Urmetzer, S.; Mayorga, L.; Lask, J.; Winkler, B.; Reinmuth, E.; Lewandowski, I. Education and Awareness in the Bioeconomy. In *Handbook on the Bioeconomy*; Viaggi, D., Ed.; Edward Elgar: Cheltenham, UK, 2025; pp. 301–331, ISBN 978-1-80037-349-5.
12. Pubule, J.; Blumberga, A.; Rozakis, S.; Vecina, A.; Kalnbalkite, A.; Blumberga, D. Education for Advancing the Implementation of the Bioeconomy Goals: An Analysis of Master Study Programmes in Bioeconomy. *Environ. Clim. Technol.* **2020**, *24*, 149–159. [CrossRef]
13. Muscat, A.; de Olde, E.M.; Ripoll-Bosch, R.; Van Zanten, H.H.E.; Metze, T.A.P.; Termeer, C.J.A.M.; van Ittersum, M.K.; de Boer, I.J.M. Principles, Drivers and Opportunities of a Circular Bioeconomy. *Nat. Food* **2021**, *2*, 561–566. [CrossRef]
14. Johnson, F.X.; Canales, N.; Fielding, M.; Gladkykh, G.; Aung, M.T.; Bailis, R.; Ogeya, M.; Olsson, O. A Comparative Analysis of Bioeconomy Visions and Pathways Based on Stakeholder Dialogues in Colombia, Rwanda, Sweden, and Thailand. *J. Environ. Policy Plan.* **2022**, *24*, 680–700. [CrossRef]
15. Schlaile, M.P.; Kask, J.; Brewer, J.; Bogner, K.; Urmetzer, S.; De Witt, A. Proposing a Cultural Evolutionary Perspective for Dedicated Innovation Systems: Bioeconomy Transitions and Beyond. *J. Innov. Econ. Manag.* **2022**, *38*, 93–118. [CrossRef]
16. Wilke, U.; Schlaile, M.P.; Urmetzer, S.; Mueller, M.; Bogner, K.; Pyka, A. Time to Say 'Good Buy' to the Passive Consumer? A Conceptual Review of the Consumer in the Bioeconomy. *J. Agric. Environ. Ethics* **2021**, *34*, 20. [CrossRef]
17. Lang, S.; Minnucci, G.; Mueller, M.; Schlaile, M.P. The Role of Consumers in Business Model Innovations for a Sustainable Circular Bioeconomy. *Sustainability* **2023**, *15*, 9573. [CrossRef]
18. Hector, V.; Friedrich, J.; Schlaile, M.P.; Panagiotou, A.; Bieling, C. From Farm to Table: Uncovering Narratives of Agency and Responsibility for Change among Actors along Agri-Food Value Chains in Germany. *Agric. Hum. Values* **2025**, *42*, 1805–1827. [CrossRef]
19. Vivien, F.-D.; Nieddu, M.; Befort, N.; Debref, R.; Giampietro, M. The Hijacking of the Bioeconomy. *Ecol. Econ.* **2019**, *159*, 189–197. [CrossRef]
20. Hinderer, S.; Brändle, L.; Kuckertz, A. Transition to a Sustainable Bioeconomy. *Sustainability* **2021**, *13*, 8232. [CrossRef]
21. Biber-Freudenberger, L.; Ergeneman, C.; Förster, J.J.; Dietz, T.; Börner, J. Bioeconomy Futures: Expectation Patterns of Scientists and Practitioners on the Sustainability of Bio-Based Transformation. *Sustain. Dev.* **2020**, *28*, 1220–1235. [CrossRef]
22. Hausknost, D.; Schriefl, E.; Lauk, C.; Kalt, G. A Transition to Which Bioeconomy? An Exploration of Diverging Techno-Political Choices. *Sustainability* **2017**, *9*, 669. [CrossRef]
23. Dieken, S.; Dallendörfer, M.; Henseleit, M.; Siekmann, F.; Venghaus, S. The Multitudes of Bioeconomies: A Systematic Review of Stakeholders' Bioeconomy Perceptions. *Sustain. Prod. Consum.* **2021**, *27*, 1703–1717. [CrossRef]

24. Friedrich, J.; Najork, K.; Keck, M.; Zscheischler, J. Bioeconomic Fiction between Narrative Dynamics and a Fixed Imaginary: Evidence from India and Germany. *Sustain. Prod. Consum.* **2022**, *30*, 584–595. [CrossRef]
25. Friedrich, J.; Zscheischler, J.; Faust, H. Preservation, Modernization, and Transformation: Contesting Bioeconomic Imaginations of "Manure Futures" and Trajectories toward a Sustainable Livestock System. *Sustain. Sci.* **2022**, *17*, 2221–2235. [CrossRef]
26. Schlaile, M.P.; Friedrich, J.; Porst, L.; Zscheischler, J. Bioeconomy Innovations and Their Regional Embeddedness: Results from a Qualitative Multiple-Case Study on German Flagship Innovations. *Progress. Econ. Geogr.* **2025**, *3*, 100044. [CrossRef]
27. Gallo, M.E. *The Bioeconomy: A Primer*; Congressional Research Service: Washington, DC, USA, 2022.
28. Giampietro, M.; Funtowicz, S.; Bukkens, S.G.F. Thou Shalt Not Take the Name of Bioeconomy in Vain. *Sustain. Sci.* **2025**, *20*, 725–739. [CrossRef]
29. Onyeali, W.; Schlaile, M.P.; Winkler, B. Navigating the Biocosmos: Cornerstones of a Bioeconomic Utopia. *Land.* **2023**, *12*, 1212. [CrossRef]
30. McCormick, K.; Kautto, N. The Bioeconomy in Europe: An Overview. *Sustainability* **2013**, *5*, 2589–2608. [CrossRef]
31. European Commission Bioeconomy Strategy. Available online: https://environment.ec.europa.eu/strategy/bioeconomy-strategy_en (accessed on 27 August 2025).
32. European Commission. *A Sustainable Bioeconomy for Europe: Strengthening the Connection Between Economy, Society and the Environment: Updated Bioeconomy Strategy*; Publications Office of the European Union: Luxembourg, 2018.
33. European Commission. *European Bioeconomy Policy: Stocktaking and Future Developments*; Publications Office of the European Union: Luxembourg, 2022.
34. Zepharovich, E.; Völker, T.; Kovacic, Z.; Serrano, Y. Bioeconomy Narratives. In *EU Biomass Supply, Uses, Governance and Regenerative Actions: 10 Year Anniversary Edition*; European Commission, Joint Research Centre (JRC), Eds.; Publications Office of the European Union: Luxembourg, 2025; pp. 44–49.
35. Proestou, M.; Schulz, N.; Feindt, P.H. A Global Analysis of Bioeconomy Visions in Governmental Bioeconomy Strategies. *Ambio* **2024**, *53*, 376–388. [CrossRef] [PubMed]
36. Georgescu-Roegen, N. The Promethean Condition of Viable Technologies. *Mater. Soc.* **1983**, *7*, 425–435.
37. International Advisory Council on Global Bioeconomy. *Global Bioeconomy Policy Report (IV): A Decade of Bioeconomy Policy Development around the World*; Secretariat of the Global Bioeconomy Summit 2020: Berlin, Germany, 2020. Available online: https://gbs2020.net/wp-content/uploads/2021/04/GBS-2020_Global-Bioeconomy-Policy-Report_IV_web-2.pdf (accessed on 27 August 2025).
38. BIOCOM Worldwide Strategies | Bioökonomie.de. Available online: https://biooekonomie.de/en/topics/in-depth-reports-worldwide (accessed on 25 June 2025).
39. Dallendörfer, M.; Dieken, S.; Henseleit, M.; Siekmann, F.; Venghaus, S. Investigating Citizens' Perceptions of the Bioeconomy in Germany—High Support but Little Understanding. *Sustain. Prod. Consum.* **2022**, *30*, 16–30. [CrossRef]
40. Faulkner, J.P.; Murphy, E.; Scott, M. Downscaling EU Bioeconomy Policy for National Implementation. *Clean. Circ. Bioeconomy* **2024**, *9*, 100121. [CrossRef]
41. Thurston, W.E.; Rutherford, E.; Meadows, L.M.; Vollman, A.R. The Role of the Media in Public Participation: Framing and Leading? *Women Health* **2005**, *41*, 101–122. [CrossRef]
42. Peltomaa, J. Drumming the Barrels of Hope? Bioeconomy Narratives in the Media. *Sustainability* **2018**, *10*, 4278. [CrossRef]
43. Kavoori, A.P. Between Narrative and Reception: Towards a Cultural/Contextualist Model of Foreign Policy Reporting and Public Opinion Formation. *J. Int. Commun.* **1997**, *4*, 99–114. [CrossRef]
44. Sanfiel, M.T.S.; Igartua, J.J. Cultural Proximity and Interactivity in the Processes of Narrative Reception. *Int. J. Arts Technol.* **2016**, *9*, 87. [CrossRef]
45. Renner, A.; Giuntoli, J.; Barredo Cano, J.I.; Ceddia, M.; Guimarães Pereira, Â.; Paracchini, M.L.; Quagila, A.P.; Trombetti, M.; Vallercillo, S.; Velasco Gomez, M.; et al. *Integrated Assessment of Bioeconomy Sustainability—Principles and Methods of an Accounting System Based on Societal Metabolism*; Publications Office of the European Union: Luxembourg, 2025.
46. Abatecola, G.; Allard-Poesi, F.; Ataci, T.; Cristofaro, M.; Kosch, O.; Lee, B.; Schlaile, M.P.; Secchi, D.; Szarucki, M.; Xian, H. Interactive Reflexivity: A Means to Addressing Methodological Challenges in International Research in Management. *Manag. Decis.* **2025**, *63*, 272–281. [CrossRef]
47. Alvesson, M.; Sköldberg, K. *Reflexive Methodology: New Vistas for Qualitative Research*, 3rd ed.; SAGE: London, UK, 2018; ISBN 978-1-4739-6424-2.
48. Sovacool, B.K.; Axsen, J.; Sorrell, S. Promoting Novelty, Rigor, and Style in Energy Social Science: Towards Codes of Practice for Appropriate Methods and Research Design. *Energy Res. Social. Sci.* **2018**, *45*, 12–42. [CrossRef]
49. Schlaile, M.P.; Friedrich, J.; Zscheischler, J. Rethinking Regional Embeddedness and Innovation Systems for Transitions Towards Just, Responsible, and Circular Bioeconomies. *J. Circ. Econ.* **2024**, *2*. [CrossRef]
50. Schlaile, M.P.; Urmetzer, S.; Blok, V.; Andersen, A.D.; Timmermans, J.; Mueller, M.; Fagerberg, J.; Pyka, A. Innovation Systems for Transformations towards Sustainability? Taking the Normative Dimension Seriously. *Sustainability* **2017**, *9*, 2253. [CrossRef]

51. Alagraa, B. Homo Narrans and the Science of the Word: Toward a Caribbean Radical Imagination. *Crit. Ethn. Stud.* **2018**, *4*, 164. [CrossRef]
52. Richardson, L. Narrative and Sociology. *J. Contemp. Ethnogr.* **1990**, *19*, 116–135. [CrossRef]
53. McBeth, M.K.; Shanahan, E.A.; Hathaway, P.L.; Tigert, L.E.; Sampson, L.J. Buffalo Tales: Interest Group Policy Stories in Greater Yellowstone. *Policy Sci.* **2010**, *43*, 391–409. [CrossRef]
54. Rudrum, D. From Narrative Representation to Narrative Use: Towards the Limits of Definition. *Narrative* **2005**, *13*, 195–204. [CrossRef]
55. Downs, J.S. Prescriptive Scientific Narratives for Communicating Usable Science. *Proc. Natl. Acad. Sci. USA* **2014**, *111*, 13627–13633. [CrossRef]
56. Fadlallah, R.; El-Jardali, F.; Nomier, M.; Hemadi, N.; Arif, K.; Langlois, E.V.; Akl, E.A. Using Narratives to Impact Health Policy-Making: A Systematic Review. *Health Res. Policy Syst.* **2019**, *17*, 26. [CrossRef]
57. Riedy, C. Discourse Coalitions for Sustainability Transformations: Common Ground and Conflict beyond Neoliberalism. *Curr. Opin. Environ. Sustain.* **2020**, *45*, 100–112. [CrossRef]
58. Viehöver, W. Diskurse als Narrationen. In *Handbuch Sozialwissenschaftliche Diskursanalyse. Band I: Theorien und Methoden*; Keller, R., Hirseland, A., Schneider, W., Viehöver, W., Eds.; Springer VS: Wiesbaden, Germany, 2001; pp. 177–206.
59. Abell, P. Narrative Explanation: An Alternative to Variable-Centered Explanation? *Annu. Rev. Sociol.* **2004**, *30*, 287–310. [CrossRef]
60. Dahlstrom, M.F. Using Narratives and Storytelling to Communicate Science with Nonexpert Audiences. *Proc. Natl. Acad. Sci. USA* **2014**, *111*, 13614–13620. [CrossRef]
61. Heller, H. *Narrative der Sozial-Ökologischen Transformation der Wirtschaft am Beispiel der Ernährungswirtschaft*; Metropolis-Verlag: Marburg, Germany, 2024; ISBN 978-3-7316-1572-9.
62. Jones, M.D.; McBeth, M.K. A Narrative Policy Framework: Clear Enough to Be Wrong? *Policy Stud. J.* **2010**, *38*, 329–353. [CrossRef]
63. Stone, D.A. *Policy Paradox: The Art of Political Decision Making*, 3rd ed.; Norton: New York, NY, USA, 2012; ISBN 978-0-393-91272-2.
64. Dobroć, P.; Bögel, P.; Upham, P. Narratives of Change: Strategies for Inclusivity in Shaping Socio-Technical Future Visions. *Futures* **2023**, *145*, 103076. [CrossRef]
65. Mendelsohn, E. The Social Construction of Scientific Knowledge. In *The Social Production of Scientific Knowledge*; Mendelsohn, E., Weingart, P., Whitley, R.D., Eds.; Kluwer Academic Publishers: Dordrecht, The Netherlands, 1977; pp. 3–26, ISBN 978-90-277-0776-5.
66. Berinsky, A.J.; Kinder, D.R. Making Sense of Issues Through Media Frames: Understanding the Kosovo Crisis. *J. Politics* **2006**, *68*, 640–656. [CrossRef]
67. Jones, M.D.; McBeth, M.K.; Shanahan, E.A. Chapter 1: A Brief Introduction to the Narrative Policy Framework. In *Narratives and the Policy Process: Applications of the Narrative Policy Framework*; Jones, M.D., McBeth, M.K., Shanahan, E.A., Eds.; Montana State University Library: Bozeman, Montana, 2022; pp. 1–12.
68. Cumming, J. The Power of Narrative to Enhance Quality in Teaching, Learning, and Research. In *Learning and Teaching for the Twenty-First Century: Festschrift for Professor Phillip Hughes*; Maclean, R., Ed.; Springer: Dordrecht, The Netherlands, 2007; pp. 17–33, ISBN 978-1-4020-5773-1.
69. Caracciolo, M. Narrative, Meaning, Interpretation: An Enactivist Approach. *Phenom. Cogn. Sci.* **2012**, *11*, 367–384. [CrossRef]
70. Albrecht, M.; Klein, O. (Re) Territorialising Policy Narratives and Their Role for Novel Bioeconomy Sectors in the EU. In *Rescaling Sustainability Transitions*; Halonen, M., Albrecht, M., Kuhmonen, I., Eds.; Springer: Cham, Switzerland, 2025; pp. 17–41, ISBN 978-3-031-69917-7.
71. Görmar, F. Weaving a Foundational Narrative—Place-Making and Change in an Old-Industrial Town in East Germany. *Eur. Plan. Stud.* **2024**, *32*, 2338–2359. [CrossRef]
72. Schlegel, L.M. Between Climates of Fear and Blind Optimism: The Affective Role of Emotions for Climate (In)Action. *Geogr. Helv.* **2022**, *77*, 421–431. [CrossRef]
73. Nabi, R.L.; Green, M.C. The Role of a Narrative's Emotional Flow in Promoting Persuasive Outcomes. *Media Psychol.* **2015**, *18*, 137–162. [CrossRef]
74. Reddi, M.; Kuo, R.; Kreiss, D. Identity Propaganda: Racial Narratives and Disinformation. *New Media Soc.* **2023**, *25*, 2201–2218. [CrossRef]
75. Wehling, E. *Politisches Framing: Wie Eine Nation Sich Ihr Denken einredet—Und Daraus Politik Macht*; Edition Medienpraxis; Herbert von Halem Verlag: Köln, Germany, 2016; ISBN 978-3-86962-208-8.
76. Norris, S.P.; Guilbert, S.M.; Smith, M.L.; Hakimelahi, S.; Phillips, L.M. A Theoretical Framework for Narrative Explanation in Science. *Sci. Educ.* **2005**, *89*, 535–563. [CrossRef]
77. Dahlstrom, M.; Ritland, R. The Problem of Communicating Beyond Human Scale. In *Between Scientists & Citizens: Proceedings of a Conference at Iowa State University, 1–2 June 2012*; Goodwin, J., Ed.; Great Plains Society for the Study of Argumentation: Ames, IA, USA, 2012; pp. 121–130.
78. Katz, Y. Against Storytelling of Scientific Results. *Nat. Methods* **2013**, *10*, 1045. [CrossRef]
79. Clark, M.C.; Rossiter, M. Narrative Learning in Adulthood. *New Dir. Adult Contin. Educ.* **2008**, *2008*, 61–70. [CrossRef]

80. Avraamidou, L.; Osborne, J. The Role of Narrative in Communicating Science. *Int. J. Sci. Educ.* **2009**, *31*, 1683–1707. [CrossRef]
81. Simoens, M.C.; Fuenfschilling, L.; Leipold, S. Discursive Dynamics and Lock-Ins in Socio-Technical Systems: An Overview and a Way Forward. *Sustain. Sci.* **2022**, *17*, 1841–1853. [CrossRef]
82. Urmetzer, S.; Pyka, A. Varieties of Knowledge-Based Bioeconomies. In *Knowledge-Driven Developments in the Bioeconomy*; Dabbert, S., Lewandowski, I., Weiss, J., Pyka, A., Eds.; Economic Complexity and Evolution; Springer International Publishing: Cham, Germany, 2017; pp. 57–82, ISBN 978-3-319-58373-0.
83. Viaggi, D. *The Bioeconomy: Delivering Sustainable Green Growth*; CABI: Wallingford, UK, 2018.
84. Majone, G. *Evidence, Argument and Persuasion in the Policy Process*; Yale University Press: New Haven, CT, USA, 1989; ISBN 978-0-300-05259-6.
85. Crow, D.; Jones, M. Narratives as Tools for Influencing Policy Change. *Policy Politics* **2018**, *46*, 217–234. [CrossRef]
86. Milkoreit, M. *Mindmade Politics: The Cognitive Roots of International Climate Governance*; MIT Press: Cambridge, MA, USA, 2017; ISBN 978-0-262-03630-6.
87. Wensing, J.; Bearth, A.; Caputo, V. Consumer Adoption of Bioeconomy Products. In *Handbook on the Bioeconomy*; Viaggi, D., Ed.; Edward Elgar: Cheltenham, UK, 2025; pp. 82–102, ISBN 978-1-80037-349-5.
88. Luederitz, C.; Abson, D.J.; Audet, R.; Lang, D.J. Many Pathways toward Sustainability: Not Conflict but Co-Learning between Transition Narratives. *Sustain. Sci.* **2017**, *12*, 393–407. [CrossRef]
89. D'Amato, D. Sustainability Narratives as Transformative Solution Pathways: Zooming in on the Circular Economy. *Circ. Econ. Sust.* **2021**, *1*, 231–242. [CrossRef]
90. Riedy, C.; Waddock, S. Imagining Transformation: Change Agent Narratives of Sustainable Futures. *Futures* **2022**, *142*, 103010. [CrossRef]
91. Hallahan, K. Strategic Framing. In *The International Encyclopedia of Communication*; Donsbach, W., Ed.; Wiley: Singapore, 2008; ISBN 978-1-4051-3199-5.
92. Eckert, S. Varieties of Framing the Circular Economy and the Bioeconomy: Unpacking Business Interests in European Policymaking. *J. Environ. Policy Plan.* **2021**, *23*, 181–193. [CrossRef]
93. Shanahan, E.A.; Jones, M.D.; McBeth, M.K. Policy Narratives and Policy Processes. *Policy Stud. J.* **2011**, *39*, 535–561. [CrossRef]
94. Lowndes, V. Storytelling and Narrative in Policymaking. In *Evidence-Based Policy Making in the Social Sciences: Methods that Matter*; Stoker, G., Evans, M., Eds.; Policy Press: Bristol, UK, 2016; pp. 103–122.
95. Shanahan, E.A.; DeLeo, R.; Koebele, E.A.; Taylor, K.; Crow, D.A.; Blanch-Hartigan, D.; Albright, E.A.; Birkland, T.A.; Minkowitz, H. Narrative Power in the Narrative Policy Framework. *Policy Stud. J.* **2025**. [CrossRef]
96. Scott, J.T.; Larson, J.C.; Buckingham, S.L.; Maton, K.I.; Crowley, D.M. Bridging the Research–Policy Divide: Pathways to Engagement and Skill Development. *Am. J. Orthopsychiatry* **2019**, *89*, 434–441. [CrossRef]
97. Epstein, D.; Farina, C.R.; Heidt, J. The Value of Words: Narrative as Evidence in Policy Making. *Evid. Policy* **2014**, *10*, 243–258. [CrossRef]
98. Haraway, D. Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective. *Fem. Stud.* **1988**, *14*, 575–599. [CrossRef]
99. Priefer, C.; Meyer, R. One Concept, Many Opinions: How Scientists in Germany Think About the Concept of Bioeconomy. *Sustainability* **2019**, *11*, 4253. [CrossRef]
100. Ciplet, D.; Harrison, J.L. Transition Tensions: Mapping Conflicts in Movements for a Just and Sustainable Transition. *Environ. Politics* **2020**, *29*, 435–456. [CrossRef]
101. De Graaff, S.; Wanzenböck, I.; Frenken, K. The Politics of Directionality in Innovation Policy through the Lens of Policy Process Frameworks. *Sci. Public. Policy* **2025**, *52*, 418–432. [CrossRef]
102. Wittmayer, J.M.; Backhaus, J.; Avelino, F.; Pel, B.; Strasser, T.; Kunze, I.; Zuijderwijk, L. Narratives of Change: How Social Innovation Initiatives Construct Societal Transformation. *Futures* **2019**, *112*, 102433. [CrossRef]
103. Janssen, M.J.; Wesseling, J.; Torrens, J.; Weber, K.M.; Penna, C.; Klerkx, L. Missions as Boundary Objects for Transformative Change: Understanding Coordination across Policy, Research, and Stakeholder Communities. *Sci. Public Policy* **2023**, *50*, 398–415. [CrossRef]
104. Franco-Torres, M.; Rogers, B.C.; Ugarelli, R.M. A Framework to Explain the Role of Boundary Objects in Sustainability Transitions. *Environ. Innov. Soc. Transit.* **2020**, *36*, 34–48. [CrossRef]
105. Reinmuth, E.; Zwack, S.G. Definition and Narratives of Bioeconomy. BioBeo Project Working Paper (V-13.01.2023). *Zenodo* **2023**. [CrossRef]
106. Chamberlin, J.E. If This Is Your Land, Where Are Your Stories? In *Finding Common Ground*; A.A. Knopf Canada: Toronto, ON, Canada, 2003; ISBN 978-0-676-97491-1.
107. Davies, S.R.; Halpern, M.; Horst, M.; Kirby, D.; Lewenstein, B. Science Stories as Culture: Experience, Identity, Narrative and Emotion in Public Communication of Science. *J. Sci. Commun.* **2019**, *18*, A01. [CrossRef]

108. Höhle, J.; Van Poeck, K. Studying Feelings in Action: An Analytical Framework for Empirical Analyses of Affect in Sustainability Transitions. *Environ. Innov. Soc. Transit.* **2025**, *57*, 101031. [CrossRef]
109. Bogner, K.; Kump, B.; Beekman, M.; Wittmayer, J. Coping with Transition Pain: An Emotions Perspective on Phase-Outs in Sustainability Transitions. *Environ. Innov. Soc. Transit.* **2024**, *50*, 100806. [CrossRef]
110. Scholz, R.W.; Zscheischler, J.; Köckler, H.; Czichos, R.; Hofmann, K.-M.; Sindermann, C. Transdisciplinary Knowledge Integration—PART I: Theoretical Foundations and an Organizational Structure. *Technol. Forecast. Social. Change* **2024**, *202*, 123281. [CrossRef]
111. Pyka, A.; Lang, S.; Ari, E. What Can the Bioeconomy Contribute to the Achievement of Higher Degrees of Sustainability? From Substitution to Structural Change to Transformation. In *Handbook on the Bioeconomy*; Viaggi, D., Ed.; Edward Elgar: Cheltenham, UK, 2025; pp. 197–215, ISBN 978-1-80037-349-5.