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Whose transformation is this? Unpacking the ‘apparatus of capture’ in Sweden’s bioeconomy

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ABSTRACT

This study investigates how and by whom the Swedish (forest) bioeconomy has been shaped so far. We unpack emerging bioeconomies as discursive constructs and use the ‘apparatus of capture’ as a conceptual framework to understand and rethink the Swedish bioeconomy. Based on analysis of empirical data from multiple sources (e.g., online surveys, in-depth interviews, participatory observations), we identify a closed bioeconomy network structure that includes forest industries, major forest owner associations, regional councils and research institutes/universities. The network (re)produces three key storylines that appeal to the majority of parties in the national parliament, defines the boundaries of relevant expertise, and discredits environmental regulation and expertise. Through these storylines the Swedish bioeconomy is turned into an issue of innovation governance, which blurs the boundaries between public and private interests in forests. To counteract future capture, different types of knowledges and forest perspectives need further exploration in Swedish bioeconomy and forest governance.

1. Introduction

As we entered the 2010s, governments and international organisations began developing dedicated bioeconomy strategies, mainstreaming the bioeconomy as a global sustainability concept (D’Amato et al., 2017). In European policy contexts, the bioeconomy mainly refers to the replacement of industrial inputs (e.g. material, energy, chemicals) currently derived from fossil resources with renewable biological resources (Bugge et al., 2016; Pfau et al., 2014). Generally, the bioeconomy concept holds the promise of connecting decarbonisation, sustainability and green growth, producing a solution to the major societal and environmental challenges of our time (Ahlqvist and Sirviö, 2019).

However, emerging bioeconomies are more than substitution of industrial inputs. Like any attempt to transform societies in more sustainable directions, they involve fundamental choices about what is to be transformed and/or sustained, how, by whom and at what cost (Patterson et al., 2017). Bioeconomies are shaped by actors holding different forms of agency, stakes and visions of desired ends, and are imbued with power struggles, resistance, value conflicts, winners and losers (Köhler et al., 2019). Although the politics and governance of the bioeconomy are increasingly explored by social scientists, there is a need for detailed empirical studies of the actors, interests, processes, practices and ideologies shaping emerging bioeconomies across different country contexts and sectors (Böcher

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et al., 2020). This article contributes by providing an in-depth empirical analysis of the Swedish bioeconomy, focusing on the forest-based sector.

Sweden is in many ways an interesting case for exploring bioeconomy politics in depth. Forests cover more than 70% of Sweden's land area and the country is a world-leading producer of forest products (Felton et al., 2020). From an international perspective, Swedish forest policy and practice is heavily production-orientated (Lindahl et al., 2017) with strong forest property rights (Sténs and Mårald, 2020), and a governance system based on voluntariness and soft instruments (e.g., stakeholder dialogues, information, advice) (Appelstrand, 2007) where the state remains a key strategic player (Sergent et al., 2018). Sweden aims to be a forerunner in the global bioeconomy and become the world's first fossil fuel-free welfare state by 2045 (Ministry of Enterprise and Innovation, 2018). As part of Sweden's climate policy action plan a formal process to develop a national bioeconomy strategy was initiated in 2019 (Bill. 2019/20:65, p. 98), and Sweden collaborates closely with its neighbouring countries to develop a Nordic bioeconomy (Nordic Council of Ministers, 2018).

Without a national strategy, the bioeconomy has still shaped the agendas and priorities in Swedish forest policy and governance during the past decade. As in the rest of Scandinavia, forest industries have become vehicles for innovation towards a Swedish bioeconomy, which has revitalised traditional industrial forestry and strengthened positions of incumbent forest actors (Bauer, 2018; Hodge et al., 2017) at the cost of social, environmental, and indigenous forest perspectives and concerns (Bennich et al., 2018; Fischer et al., 2020; Grundel and Dahlström, 2016). Meanwhile, conflicting policy goals have become increasingly concealed, obstructing the need for trade-offs in Swedish forest policy and governance (Fischer et al., 2020). While scholars have identified different bioeconomy narratives and their power effects, less is known about the actors and practices shaping and institutionalising these narratives (Bauer, 2018; Giurca, 2020).

The aim of this article is to provide a deeper understanding of the emerging Swedish bioeconomy by investigating (1) *who* are the key actors, and (2) *how* they have shaped the direction of the Swedish bioeconomy to date. Understanding by whom and how the Swedish bioeconomy is shaped and institutionalized will fill an important knowledge gap and can help to open up the (forest) bioeconomy debate for discussion, contestation and remaking.

To empirically unpack the Swedish bioeconomy we use the 'apparatus of capture' (Bixler et al., 2016) as a conceptual framework, which refers to the wide array of strategies through which actors mobilise meaning and shape the objectives, dynamics and outcomes of governance processes. Theoretically, we approach emerging bioeconomies as constituted by discourse and argue that any understanding of these processes requires analysis of how different bioeconomy narratives open up/close down transformative political action, and how actors shape, (re)produce and resist different narratives (Leipold, 2021). To unpack not only the narratives, but also the actors and practices mobilising them, we used a mixed methods approach. First, a quantitative actor network analysis was conducted to identify the key actors. Second, we conducted a qualitative discourse analysis based on policy documents, interviews, media reporting and participant observations. Here we drew on the Discursive Agency Approach (DAA), which is an analytical heuristic focusing on actors and their practices of shaping policy outcomes (Leipold and Winkel, 2017).

2. The politics and governance of emerging bioeconomies

The past decade has witnessed a striking volume of academic contributions dealing with bioeconomy-related issues, particularly in engineering and natural sciences, and in topics relating to bioenergy and biorefineries in North-Western Europe (Lovrić et al., 2020). The social science literature has predominately been implementation based, focusing on overcoming technical, regulatory or economic hurdles towards a full bioeconomy realisation. However, social scientists increasingly move beyond treating bioeconomies as techno-industrial projects, and have started directing attention to the politics of emerging bioeconomies (Böcher et al., 2020; Holmgren et al., 2020). This article contributes to this strand of bioeconomy research.

The literature on the politics of the bioeconomy identifies three main bioeconomy visions. The first one focuses on new science and technologies, and is mainly reproduced by the biotech industry, the USA and the OECD. The second vision, which dominates in the EU, is centred on biomass and developing industries and value chains based on the use of renewable resources (in particular woody biomass) to substitute fossil-fuels (Hausknot et al., 2017; Vivien et al., 2019). The literature also identifies a third, less vocal, vision on the rise, which highlights the limits of natural resource extraction, and questions the uneven and unequal distribution of wealth between populations and generations (Pavone and Goven, 2017, p. 6).

In terms of allocation of authority and responsibility, the first and second bioeconomy visions reflect an innovation-as-governance imaginary that has put the private sector in a key position (Doezema and Hurlbut, 2017, p.59). The focus on substitution of fossil-fuels with forest biomass has encouraged diversification and renewal of forest-based products, particularly through biorefineries, which have become the main vehicles for innovation, industrial renewal and fossil-fuel independence (Bauer, 2018). Borrowing from the language of the petroleum industry, biorefineries refer to multi-product factories of fuels, fibres and chemicals from wood-based biomass (Näyhä and Pesonen, 2012). Innovative and skilled entrepreneurs have become key agents of change, along with the creation of regional systems (referred to as hubs or clusters) where actors collectively drive bioeconomic innovation. Governments primarily have a supporting role, e.g. facilitating cross-sectoral collaboration and coordination and removing regulatory barriers (Kuckertz et al., 2020). However, Pavone and Goven (2017, p.8) warn that these visions conceal the importance of local ecosystems, reduce place to innovation clusters, and disembody the social and ecological from emerging bioeconomies.

Empirical research notes that these warnings need to be taken seriously. Dominant bioeconomy visions have shaped the agendas, priorities and power relations in forest policy and governance, particularly in forest-rich countries (Sotirov and Arts, 2018). Research shows a weak consideration for environmental concerns in bioeconomy policy discourses in the EU and its Member States (Kleinschmitt et al., 2017; Ramcilovik-Suominen and Pülzl, 2016). Studies from Finland show a dominance of major forest industry representatives

in policy development (Korhonen et al., 2018; Kröger and Raitio, 2016), and that the bioeconomy relegates rural areas to resource suppliers (Ahlqvist and Sirviö, 2019), thus marginalizing social and local concerns (Mustalahti, 2018). Similarly, narratives in the Finnish media lack roles for certain actor groups, such as citizens (Peltomaa, 2018). Mass media coverage of bioeconomy in other countries, such as Spain, also seems to largely reproduce bioeconomy narratives constructed by the government, thus failing to account for the plurality of forest stakeholders and the multifunctionality of forests (Sanz-Hernandez et al., 2020). In Germany, Giurca (2020) traces the origin of the country's bioeconomy clusters back to the late 2010s and describes their emergence as a result of governmental support in the backdrop of the financial crisis. Today, these clusters are key strategic players in the German bioeconomy, indicating the complexity of bioeconomy politics.

Similar findings have been noted in the Swedish context. Jolly et al. (2020) describe how regional Swedish bioeconomy clusters (e.g. the concentration of forest-related industries in a particular location) emerged as early as the 1990s. Fierce competition from Asian and South American firms led to reduced profitability and mill closures in the Swedish pulp and paper industries. In response, regional policy interventions were made to support innovation and development in these industries and uphold regional economic growth. Regional authorities introduced the cluster concept and began nurturing collaboration between regional industries, previously competing on regional markets, to strengthen their position globally (Jolly et al., 2020). Today the bioeconomy clusters function as brands for industries and as geographical coordinators of universities, regional authorities and firms (Grundel and Dahlström, 2016). They operate as important storytellers at multiple scales, mobilising legitimacy and support for their bioeconomy initiatives regionally, nationally, and at EU-level (Jolly et al., 2020). Some scholars argue that Swedish forest industry and forest owner associations have approached the bioeconomy concept as an opportunity to promote the forest sector and intensive forestry as part of a greener future (Hodge et al., 2017). Bauer (2020) however calls for more nuanced analysis. He identifies competing narratives among industries in the biorefinery sector as regards e.g., the scope of the bioeconomy (energy or advanced products) and the role of the state (ensure long term rules or actively support new industry pathways), and warns that presuming consensus among forest industry actors may close debate about possible bioeconomy policy strategies. Bennich et al. (2018) move beyond product innovation to the local and environmental realities of biomass production. They challenge the notion of Swedish forestry as sustainable, claiming that diversified forest management is fundamental for a sustainable bioeconomy transformation (Bennich et al., 2018).

Although existing research paints a rather unanimous picture of the direction and implications of the emerging Swedish bioeconomy on forest politics and governance, more attention needs to be directed at the actors and practices that render dominant narratives cultural common sense. This is especially important if we want to understand, rethink and remake the emerging Swedish bioeconomy.

3. Methods

3.1. Analytical framework

In the context of large-scale nature conservation, Bixler et al. (2016) use the term 'capture' to conceptualise the diverse ways in which actors shape environmental governance processes. Here, we empirically extend the use of the term to bioeconomy contexts.

Processes of capture can have several manifestations but share some typical characteristics. For example, to gain credibility and authority, Bixler et al. (2016) note how actors stake out relevant areas of expertise and defend expert boundaries to control the objectives of governance. In cases of scientific uncertainties, selective use, delegitimisation and contestation of scientific expertise are particularly apparent and spread efficiently on digital platforms. Additionally, online and social media facilitate immediate interactions and provide new ways of connecting actors in distant places, which enables different communities of interest to network more easily (Bixler et al., 2016). To navigate complex governance arrangements successfully and pursue their interests and agendas, actor networks must also exhibit capacities to cross territorial and administrative borders and operate in several jurisdictions simultaneously (Jessop, 2009).

To unpack the apparatus of capture in detail, two concepts are of central importance to our analysis: discourse and practices. Discourse is defined here as that which 'sets limits upon what is possible to think, write or speak about a given social object or practice' (McHoul and Grace, 1993, p.32 in Bacchi and Goodwin, 2016, p. 35). To analyze how discourse is (re)produced or challenged, the analytical target is the doing, i.e. the practice. Practices here refer to the ways in which actors construct and stabilise meanings or 'truths' about an issue and an actor's position in relation to this 'truth'. Such practices include the production of storylines, the use/contestation of scientific expertise, coalition building, utilisation of available subject positions, promotion of particular governance arrangements, or endorsement of administrative, legal and/or management reforms (Leipold and Winkel, 2017, pp. 526–527). A detailed description of the interpretive repertoire used to investigate and identify the apparatus of capture is presented in Section 3.2.

3.2. Network analysis

The identification of key actors shaping the Swedish bioeconomy (the 'who' question) was undertaken in two steps. First, we scanned scientific publications, policy documents and webpages to identify organisations and individuals engaged in Swedish bioeconomy issues. This review identified 197 individuals representing universities, industries, networking organisations, non-governmental organisations (NGOs), consultancies and public agencies relevant to forests. These individuals were then sent a web-based survey featuring 24 closed and open-ended questions, with respondents asked, among other things, to name the organisations (not necessarily Swedish) they perceive as particularly influential in the Swedish bioeconomy and indicate the organisations with which they collaborate. Of the 197 surveys distributed in spring 2018, we received 84 responses, of which 62 were complete (response

rate 43%).

Based on the survey responses identifying key actors in the Swedish bioeconomy, we performed a quantitative network analysis to illustrate the key actors (organisations or individuals) and the way in which they interact and form webs of social relations (Borg et al., 2015; Borgatti et al., 2009). The survey responses were statistically analyzed and visualised using the open-source software Gephi 0.9.2 (<https://gephi.org/>). The actor relations and influences were analyzed by means of actor-level measures, such as ‘betweenness’ and ‘degree centrality’, which provide some basic descriptions of the role of actors (‘nodes’ in graph theory jargon) in the network. ‘Degree centrality’ is a network measure that refers to the number of nodes to which one node is connected. This measure considers both out-degree (the number of edges going to other nodes) and in-degree (the number of incoming edges). ‘Betweenness centrality’ refers to how many times a node rests between two others that are themselves disconnected (Freeman, 1977; Wasserman and Faust, 1994). It indicates the extent to which it can play the part of a ‘broker’. Brokers are important nodes in the network as they can act as information ‘gatekeepers’ or ‘bridge-builders’ bringing together disconnected segments of a network (Freeman, 1977).

3.3. Discourse analysis

To identify how key actors shape the bioeconomy, we conducted a discourse analysis using the typology of practices (Table 1) suggested by Leipold and Winkel (2017, pp. 526–527). The discourse analysis was based on interviews, notes from participant observations at conferences and meetings, and media and policy documents on the bioeconomy (Appendices A and B). The different sources of data informed each other continuously between 2017 and 2020.

In the absence of a national bioeconomy strategy, two different bioeconomy initiatives were analyzed in detail: the government-led innovation programme *Circular and Biobased Economy*, and the *Regional Bioeconomy Network*. The Circular and Biobased Economy innovation programme was one of five innovation partnership programmes established by the government in 2016 to develop new and innovative ways of dealing with major societal changes. The Regional Bioeconomy Network was initiated by Region Västerbotten¹ in collaboration with Biofuel Region (a forest industry cluster) in northern Sweden. It ran as a project 2017–2020 with the aim of facilitating regional collaborations and boosting regional bioeconomy investments. We regard them as two important initiatives shaping the Swedish bioeconomy in the last few years. To gain insights to their operation we conducted interviews with their participants, representing a diversity of public and private organisations (Appendix A).

The material (interview transcripts, field notes, policy documents, media reporting) was coded manually by the first author and structured in accordance with the DAA’s typology of practices (Table 1). Focus was on: identifying *story lines*; how actors gather and interact around storylines as an indication of *coalition building*; how actors use/resist available *subject positions* and *use/contest scientific knowledge*; whether actors promote particular *governance arrangements* and/or endorse *administrative, legal and/or management reforms*; and whether/how actors conceive of the *organisation of state administration*. As these practices are often coupled with claims to scientific or normative authority, additional attention was paid to how actors use scientific arguments, e.g., to *rationalise or polarise, mobilise emotions* and *delegitimise opponents* (Leipold and Winkel, 2017). Lastly, considering that network actors typically operate on multiple scales simultaneously, attention was paid to any *operation of actors across scales*.

4. Unpacking the ‘apparatus of capture’

The following sections outline the network analysis, followed by a detailed presentation of the apparatus of capture.

4.1. Who captured the Swedish bioeconomy?

The network analysis suggests that the Swedish bioeconomy network consists of 167 organisations (nodes) and 324 connections (edges) organised in a highly centralised network in which a few organisations hold the majority of ties with others (Fig. 1). The size and color of each node corresponds to its ‘degree centrality’: the total number of nodes to which an organisation is connected, taking both outgoing and incoming edges into account. The top five most central organisations, their connections listed as their incoming and outgoing ties, and their degree and betweenness-centrality measures are presented in Table 2. This table indicates which organisation has the most incoming and outgoing connections (degree centrality), and which ones play the role of ‘brokers’, bringing together disconnected segments of a network (betweenness centrality).

However, the connections between nodes in the network illustrated in Fig. 1 also indicate the existence of a ‘network within a network’, involving close cooperation between biorefinery research organisations (e.g. RISE and RISE Processum), the forest industry (e.g. the Swedish Forest Industry Federation, *Skogsindustrierna*), and forest owner associations (e.g. LRF Forest Owners, *LRF Skogsägarna*), and regional clusters such as Biofuel Region (Northern Sweden) and Paper Province (Middle Sweden).

Beyond the central nodes, the broader network includes municipalities and regions, universities (e.g. the Swedish University of Agricultural Sciences, Lund University, Umeå University, Mid Sweden University) and private research institutes (e.g. the forestry research institute *Skogforsk*), additional forest industry clusters (e.g. the Cluster of Forest Technology, Piteå Science Park), the state-owned forest company *Sveaskog*², and non-governmental organisations with which the World Wide Fund for Nature (WWF) has the

¹ Regional level in Sweden means the 21 spatial divisions (regions) of the country that are responsible, for example, for providing a large share of public services, implementing national growth and innovation strategies, and establishing regional development strategies.

² Largest landowner in Sweden, selling sawn logs, pulpwood and biofuels. <https://www.sveaskog.se/en/about-sveaskog/>

Table 1
Interpretive repertoire (elaborated version of Leipold, 2021, p. 4).

Organisational & governance practices	Discursive practices	
Coalition building: actors gathering around the same storylines	Agents produce (counter) storylines when they interpret social or physical events (in)consistent with their preferences (e.g. ideological, economic, cultural)	Delegitimisation strategies render an opponent’s storylines and practices inappropriate or wrong
Governance strategies: promotion of policy change (e.g. regulatory reform), restructuring of governance arrangements or particular governance processes	Divide and conquer practices refer to the discursive division of (groups of) agents, e.g. by ascribing them positive or negative qualities	Employing normative power means connecting concepts, agents or activities with strong and generally accepted values
Organisational strategies: questioning of the organisation of state administration, including e.g. policy implementation, management and control of law enforcement	Rationalisation and scientification vs emotionalisation and polarisation of political debates means mobilising and reinforcing available rational or emotional patterns	Re- and de-issuing means dropping or re-connecting problems or solutions to an issue
		Exclusion strategies encompass the active foreclosing or passive non-reference to an agent, problematisation or solution

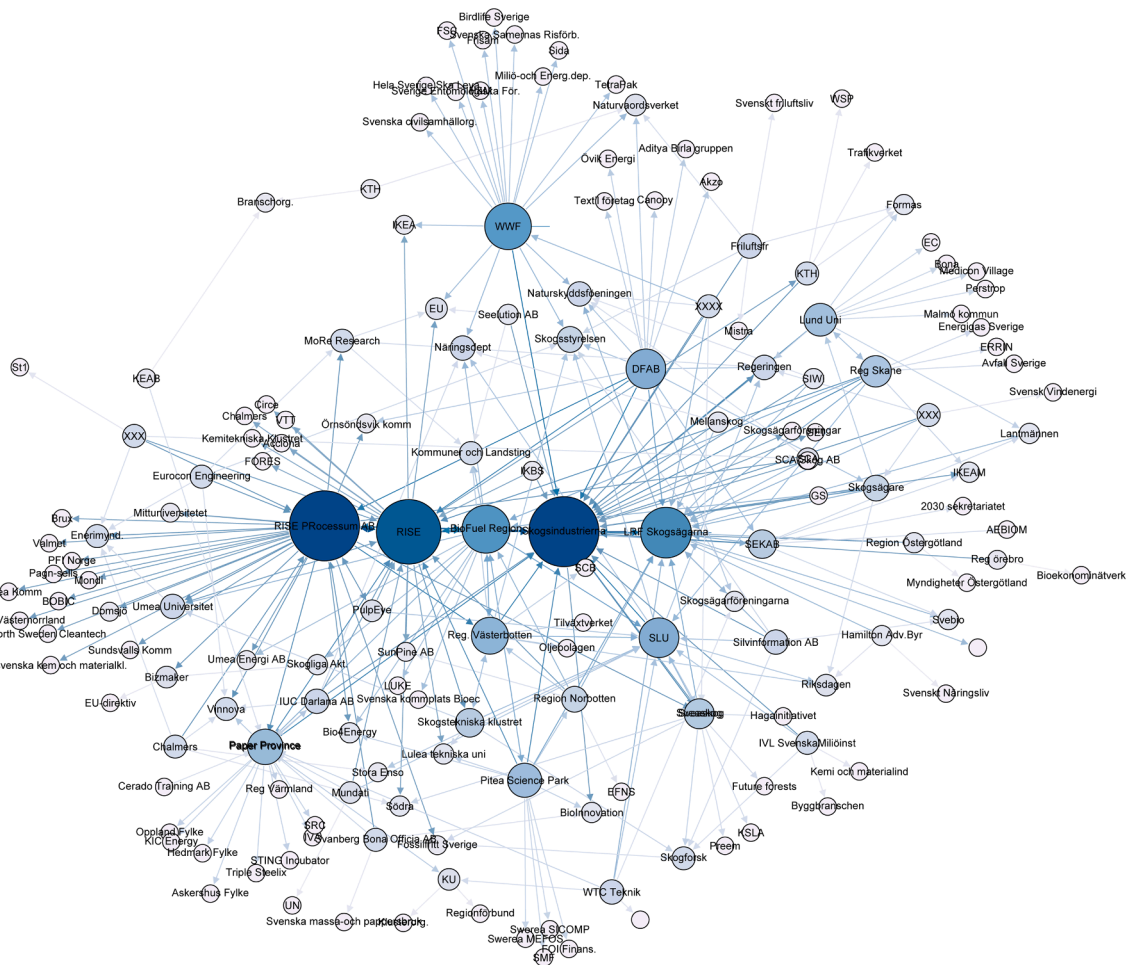


Fig. 1. The Swedish bioeconomy network ($N = 167$). The larger the node and the darker its color, the greater its degree centrality. The names of the organisations are given within the nodes. The organisations that wanted to remain anonymous are listed ‘XXX’. Edges are directed and colored according to their source.

most contacts. In general, the dominance of domestic actors in the network make the Swedish bioeconomy appear very Sweden centric.

In sum, the network analysis illustrates that Sweden’s bioeconomy is primarily a domestic growth and industry project, pursued by traditional forestry actors (forest industries, forest owner associations), research institutes and universities (engineering, forestry) and regional councils with responsibility for innovation and growth policy. The bioeconomy seems to have provided a strong link between public interests in regional growth, forest industry renewal and national fossil-fuel independence, where biorefineries are of particular importance.

Table 2
Top five central actors in the network.

No.	Organisation	About	In degree	Out degree	Degree centrality	Betweenness Centrality
1	RISE Processum AB	RISE Processum AB is a company owned by RISE Research Institutes of Sweden (60%) and Processum Interest Association (40%), and is a subsidiary of the RISE group. Its main focus is on supporting and initiating research and development within biorefinery development ^a . The interest association comprises private and public corporations mainly related to pulp, paper and energy industries.	8	31	39	675.07
2	The Swedish Forest Industries Federation (SFIF) (in Swedish: Skogsindustrierna)	The Swedish Forest Industries Federation is the organisation for Swedish pulp, paper and woodworking industries. It represents a number of pulp and paper manufacturers owned by different groups of companies ^b .	31	8	39	325.60
3	RISE	Research Institutes of Sweden AB (RISE), a Swedish state-owned research institute, collaborating with universities, industry and the public sector ^c . The government's research and innovation bill states that the overarching goal of the research institutes gathered under the RISE AB umbrella is to be internationally competitive and facilitate sustainable growth in Sweden by strengthening competitiveness, industrial renewal and innovation in the business community.	15	20	35	684.38
4	The Federation of Swedish Farmers (LRF), Department of Forest Owners (LRF Skogsägarna)	The Federation of Swedish Farmers (LRF) is an interest and business organisation for the "green industry" with ca. 140,000 individual members. LRF Forest Owners is a department within LRF with responsibility for forest issues, and also an industry organisation for the three forest owner associations Södra, Mellanskog and Norra skog ^d .	18	7	25	197.69
5	BioFuel Region (public-private partnership)	BioFuel Region is a member-owned, not-for-profit organisation in northern Sweden including municipalities, landowner organisations (i.e. regional LRF offices) and companies. It aims to develop a low carbon vehicle fleet and a bioeconomy by initiating, coordinating and collaborating on projects. The organisation collaborates with the public sector, industry, research and development ^e .	7	16	23	551.38

^a <https://www.ri.se/en>.

^b <https://www.forestindustries.se/about-us/>.

^c <https://www.processum.se/en/sp-processum/about-us>.

^d <https://www.lrf.se/om-lrf/organisation/branschavdelningar/lrf-skogsagarna/>.

^e <https://biofuelregion.se/en/va>.

4.2. Practices of capture

This section is structured according to themes of the interpretive repertoire (Table 1) and presents the results of the discourse analysis, dismantling the apparatus of capture.

4.2.1. Storylines and coalition building

The discourse analysis led to the identification of three main storylines that group together the key actors identified in the network analysis, and appeal to nearly all political parties in the Swedish parliament apart from the Left Party and parts of the Environmental Party.

The first storyline, *Substitution requires increased production of forest biomass* (substitution storyline), suggests that current forest production systems and management practices are sustainable and must be strengthened to mitigate climate change. The substitution storyline is closely linked to the way in which forest biomass and forest carbon are accounted for in climate policy, and is decisive for the way in which forest industries can brand themselves and their products (e.g. as green, sustainable, climate mitigating). The substitution storyline is accompanied by a number of metaphors for the carbon sequestration capacity of trees and wood products, such as 'The forest works like a vacuum cleaner' (LandSkogsbruk, 2019) and 'Sweden's trees are climate heroes' (LRF, 2016). Over the past few years, this storyline has been conveyed through advertisements in national newspapers and on television, and in the Stockholm subway, as part of a public advocacy campaign named 'Swedish Forest' (Svenska Skogen). In 2017, several of the actors identified as key in the actor network analysis (e.g. SFIF, LRF and the state-owned forest company Sveaskog) joined forces with the goal of mass-educating the general public about Swedish forests and their multiple uses (Swedish Forests, 2020).

Another forum in which the substitution storyline is concisely reproduced is the Royal Swedish Academy of Agriculture and Forestry (KSLA), which holds a peripheral position in the actor network analysis (Fig. 1). KSLA is a network organisation whose mission is to promote agriculture and forestry with the support of science and practical experience (KSLA, 2021). For example, in a recent publication KSLA elaborates on the pros and cons of what it refers to as two alternative approaches to climate change and forests: the substitution versus storage approach. The publication highlights the core argument of the substitution storyline, namely that wood can replace fossil energy and materials. As new forests are planted on felled forestland, CO₂ is taken up in the next forest generation. If the harvest does not exceed growth, forestry is considered sustainable from a resource perspective (KSLA, 2020, p. 15). The report outlines the rejection of the storage approach common to the key actors of the bioeconomy network (Fig. 1), with the argument that storage in standing forests merely delays emissions without any positive effects. Instead, the substitution and maintenance of the current forestry infrastructure is represented as beneficial for handling the anticipated effects of climate change on forestry:

Another risk with the storage strategy is that stored carbon can be lost to the atmosphere in connection with drought, storms, disease, insect infestation and fire. In addition, the conditions for limiting, for example, insect damage after storms or droughts are likely to be hampered by the weakening of the infrastructure for efficient forestry work due to reduced maintenance of the forest road network and a reduced number of forest workers and forest machines. (KSLA, 2020, p. 16)

The substitution storyline narrowly delimits the bioeconomy as an issue of woody biomass production, whereas climate change adaptation and biodiversity, for example, are disconnected from bioeconomy development. The substitution storyline not only promotes increased forest production on seemingly rational grounds, but also turns it into a moral issue. At the opening of the 2018 Bioeconomy Parliament,³ the former Minister of Rural Affairs, Sven-Erik Bucht, claimed that ‘Swedish forestry is the most sustainable in the world’ and that ‘increased use of biomass is a matter of survival’ (observation, March 21, 2018).

The second storyline, *Technological innovation is key to a greener future* (technological innovation storyline), rests on the notion that everything made from fossil fuels can be made out of wood, and is rooted in engineering sciences. As with the substitution storyline, it attributes a key role to Swedish forest industries and is based on a division of carbon dioxide emissions. Emissions from wood-based biomass are referred to as green, biogenic⁴ and climate neutral, while emissions from fossil fuels are black and climate damaging. The division of carbon emissions is particularly evident in metaphors relating to green fuels, reflecting the central position of biorefineries in the Swedish bioeconomy network (see Fig. 1). At the bioeconomy parliament in Karlstad in 2018, the government’s special investigator for sustainable biofuels for air traffic (and former spokesperson of the Environmental Party) proclaimed that ‘Sweden will be the new Norway. We have the green gold’ (observation, 21 March 2018).

Other opportunities associated with the technological innovation storyline are expressed in the Swedish climate strategy, which is largely based on increased use of biofuels combined with a technical solution called bioenergy with carbon capture and storage (bio-CCS). Bio-CCS turns emissions from forest industries into an opportunity in the national quest for negative emissions:

Abundant access to biomass as a raw material for the pulp and paper industry has resulted in Sweden having a large number of significant point emission sources of biogenic carbon dioxide. In addition, the use of biomass residues from forest management and forest industries has given rise to several large point emission sources of biogenic carbon dioxide in the energy sector. The potential for negative emissions at these sites through the application of bio-CCS (capture, transport and storage of carbon dioxide of biogenic origin) is high. (SOU, 2020:4, p. 71)

Since capturing biogenic carbon dioxide emissions is a public value that does not generate any economic value for the operators, the government enquiry suggests that the State guarantees a demand for negative emissions and bio-CCS (SOU, 2020:4, p. 102), i.e. that the costs of reducing emissions stemming from commercial private interests are, at least initially, publicly funded.

The third storyline, *Good ownership storyline*, links the substitution and innovation storylines to those formally controlling the resource: forest owners. Efforts to rationalise forestry practices among forest owners suggests that forest owner associations take a lead role as promoters of a rational and financially profitable forestry, representing forest owners primarily as rational economic subjects. Based on an instrumental logic rooted in anthropocentric arguments, the Swedish Farmers’ Union claims that trees simply ‘need their people’ in order to store carbon and be valuable:

Trees that are not used, trees that are only left in the forest to dry or are attacked by insects when they are old and fragile, do not do the same good for the climate. For the trees to be climate heroes, they need to be farmed, felled and replanted in a cycle. They need someone to make sure that they get light and space and that too many trees are not competing for the same place. They need someone to look after and take care of them. In short, trees need their people (LRF, 2016).

The quotation above reiterates the differentiation of cultivated and natural forests that gained ground in the early 1900s, where natural forests need to be subjected to the disciplining hand of man before reaching perfection and generating revenue (Sörlin, 1981, pp. 117–118). As with the case of the substitution storyline, the good ownership storyline has been conveyed in a public advocacy campaign, ‘The Good Ownership’ (*Det goda ägandet*), run by LRF. The campaign conveys the message of the storyline, and presents forest owners as responsible individuals unfairly hit by environmental regulations. Launched in 2016, the campaign aims to strengthen

³ A two-day event described as a platform for leading organisations, key individuals and decision-makers to meet and develop a common understanding of strategies and necessary policy action on the forest-based bioeconomy.

⁴ Biogenic carbon is carbon that is sequestered from the atmosphere during biomass growth and released back to the atmosphere later due to combustion of the biomass or decomposition (Stamford, 2020).

private property rights, increase public acceptance of the green sector, and strengthen the environmental ethos of Swedish forest owners. In a publicly available document with information on the campaign targeted at LRF members, use of the term ‘private’ is deliberately avoided to shift the focus away from private benefits to the public values generated by individual forest owners. In the same document, members are encouraged to pursue the campaign message and contact regional representatives for further engagement (LRF, 2020a). The campaign has largely been driven via social media where LRF, for example, has had individual forest owners tweeting the campaign message directly to members of the European Parliament, particularly before important votes. LRF describes the campaign as being influential in Brussels, arguing that other Member States are becoming increasingly positive about the Swedish forestry model (LRF, 2020b).

4.2.2. Scientific knowledge, polarisation, and emotions

The (re)production of the three key storylines described above is implicated with the practice of staking out relevant scientific knowledge and expertise, where engineering and forestry sciences in particular grant them rationality and normative authority. With the aim of bringing clarity to scientific uncertainties around the regulation of flows of carbon between forests and the atmosphere, KSLA organised an international conference in 2018, exemplifying how boundaries of relevant scientific expertise are created and defended. The conference report describes the focus of the conference as delimited to climate change mitigation, but does not explain reasons for the exclusion of what are acknowledged as important related issues, e.g. climate adaptation, biodiversity, and the capacities of forests to support a multitude of ecosystem services (KSLA, 2018). With the exclusion of these issues from the climate-forest nexus, the boundaries of relevant expertise, e.g. carbon cycle and forestry research, are staked out and maintained.

The title of the conference report, *Manage for maximum wood production or leave the forest as a carbon sink?*, reinforces a dichotomous picture of Sweden’s forests with respect to climate change:

There are two approaches. One claims that active forestry is best for the climate: the more growth, the more we can harvest and the better for the climate. [...] The second view is that we do our best to leave the forest standing because forests that are left untouched store carbon. [...] (KSLA, 2020, pp. 15–16)

The dichotomous ‘either/or’ representation reifies the polarisation between production and conservation interests in forests and marginalises the areas of knowledge and expertise ‘in between’ (such as diversified forest management practices, e.g. mixed forests, continuous cover forestry), which call for a more integrated approach to the climate and biodiversity crisis and to diverse human interests in forests (Felton et al., 2020).

The analysis further shows how dominant actors in the bioeconomy network tend to belie or confuse research in the fields of ecology and biological sciences with environmental activism. For example, in a recent official government report investigating how Sweden can achieve negative emissions by 2045, alarms over the risks of degraded biodiversity and unsustainable land use following on from biomass production are referred to as ‘concerns of the environmental movement’ (SOU, 2020:4, p. 357). The empirical material also includes instances of more open discrediting of opponents. In a debate article on biofuels in a national newspaper, a group of forest specialists working in the forest industry (their signatories indicate academic titles and KSLA membership) concludes:

Our successful forestry is based on long-running and long-term commitments from society, landowners and industry. The climate benefit is delivered on a large scale here and now, and it increases even more with economic and sustainable development. Because it’s so urgent, forestry’s role as a climate change solution must be strengthened, not eroded by ideologically-based arguments painted in the colors of science. (SvD, 2020)

While ideology and emotions are aspects attributed to opponents, portrayed as illegitimate parts of rational argumentation, the authors represent themselves as objective and free from ideological and normative influences.

Generally, key actors in the bioeconomy network mobilise ideology and emotions effectively to shape public opinion and attract political support. Environmental regulation is repeatedly represented as a threat to individual forest owners’ control of their forests, and the instruments used to implement the environmental regulation are repeatedly contested.

For example, in line with the ‘Good Ownership’ storyline, the forest owner association *Södra* claims that the Aarhus Convention,⁵ which was ratified by Sweden in 2005, poses a threat to private forest ownership:

Sweden has ratified the UN’s Aarhus Convention, which contains rules that the public shall have access to environmental information, the right to participate in major decision-making processes, and access to justice in environmental matters. If new provisions are introduced with opportunities for appeals in the Forestry Act, there is a risk that normal forestry measures may be subject to a judicial review. It opens up opportunities for judicial activism by organisations, which may result in restrictions in people’s right to use their own land. (Södra, 2021)

Other examples of resistance to environmental regulation are the opposition to SFA’s digital publication of forest felling notifications (Södra, 2021) and to inventories of woodland key habitats (WKHs) in the mountainous areas of north-west Sweden, where the rest of the country’s old growth forests are located (LRF, 2021). The WHK concept is well-established in northern Europe to identify sites in forest landscapes with particularly high biodiversity (Timonen et al., 2010). The opposition of environmental regulation is often coupled with delegitimation of the work of the state forest administration and a cultivation of distrust in public officials. For example, in a debate article in a national business newspaper, a legal expert from LRF claimed that state agencies were being infiltrated

⁵ United Nations convention connecting human rights with environmental issues through public access to environmental information, public participation in environmental decision-making, and access to justice (<https://ec.europa.eu/environment/aarhus/index.htm>).

by ‘green activists’ aiming to ‘rewild’ Swedish forests (Treschow, 2020).

4.2.3. Navigating across a networked governance arrangement

Apart from gathering around and (re)producing stories shaping the meaning of Sweden’s bioeconomy, other aspects stand out as important practices of capture: (1) having the capacity to operate in and across bioeconomy-related initiatives and policy processes simultaneously; (2) going regional (e.g. constructing the bioeconomy as a regional issue); (3) moving across and doing advocacy work at multiple levels of governance (local, regional, national, EU); and (4) opposing environmental regulations.

First, the key actors identified participate in several state-led processes simultaneously and navigate across different policy domains, e.g. forest industry and landowner associations are engaged in national and regional forest programmes (SFA, 2021). These are key processes in Swedish forest governance framed as a broad dialogue on the role of forests in a sustainable society and growing bioeconomy (Ministry of Enterprise and Innovation, 2018). Key network actors also hold strong positions in innovation governance where innovation programmes are key instruments for achieving the objectives. Interviews with participants involved in the Circular and Biobased Economy innovation programme describe how large players with substantial resources used their already existing projects and networks to make the most of the programme. They had the capacity to participate in and shape the direction of the six working groups established: (1) Wood Construction, (2) Circularity/Resource Efficiency, (3) Innovative Bioresources, (4) Biofuels, (5) New Materials and (6) Upscaling and Commercialisations. With some evident disappointment, one of the interviewees concluded:

It didn’t become a meeting place for major issues around the role of the forest, diversity, environmental actors and so on... They simply weren’t there. It was those who wanted to make new biofuels and build a lot more in wood. Yes, they were there.

The criticism raised in the interviews is supported by an evaluation of the innovation programmes conducted by the National Audit Office (NAO)⁶ (*Riksrövisjonen*). The evaluation concluded that the innovation programmes lack transparency and documentation, depart from the Swedish management model by involving politicians in the collaborative processes and appointing participants on a personal mandate, and give large companies and individuals substantial influence in policy formulation (NAO, 2020). When the bioeconomy is being categorised as an object of innovation governance, the plurality of stakeholders is drastically reduced, along with the diversity of perspectives on, and interests in, Swedish forestry.

Second, categorising the bioeconomy as an object of innovation governance implies that the bioeconomy is turned into a regional issue, which is logical considering that business and industry policy is a regional competence area in Sweden (Nilsson, 2016). Going regional also makes sense in view of the strong positions of regional bioeconomy clusters and regional councils in the network analysis, which operate in close collaboration on a regional scale. This striving for the regional is summarised in a comment made by a public official at the Ministry of Enterprise and Innovation upon the establishment of the Regional Bioeconomy network:

It’s out in the regions that the real transformation is taking place. That’s why it’s so important that this bioeconomy network is set up and that we in the government offices get a good point of entry into the regions and municipalities on bioeconomy issues (DI, 2017).

A third key practice identified is the conduction of advocacy work in Brussels. In interviews with members of the Regional Bioeconomy network, the regional offices in Brussels appear to be central to the way in which the bioeconomy has been approached. To safeguard regional interests, many of Sweden’s 21 regions are represented in Brussels through regional offices (SKR, 2021). This presence in Brussels has meant that many regions have anticipated bioeconomy development becoming a key policy issue, and have thus been working proactively to shape national and regional agendas. A public official working on growth issues in a region in northern Sweden exemplifies how this anticipation may work in practice, and how private and public interests are blurred in the process:

We had a pilot study conducted by the Swedish Federation of Farmers since there has been a demand, or pressure has been placed on us, for the development of a regional forest strategy. This was done in parallel with signals from above that a directive may be in the pipeline and it has now landed at the regional level. But this has gone on in parallel. So during the spring we’ve had meetings in the steering group led by the Swedish Federation of Farmers about a pilot study investigating what needs to be developed in a strategy like this, which parties would need to be involved and so on. Then the direction came that the Swedish Forest Agency will be responsible for developing regional forest strategies throughout the country.

Just as Swedish regions are present in Brussels, forest owner and forest industry associations have recently established offices with a permanent presence in the EU capital to safeguard their interests (LRF, 2019; SFIF, 2019). Often expressed in warlike rhetoric, they cultivate the idea that Swedish forestry is under attack in Brussels. The chairman of the board of one of the major forest owner associations (a former MEP and Swedish Minister of the Environment representing the Centre Party) concludes: ‘Negotiations in Brussels are moving fast. And there are legislative matters underway that can mean life or death for the Swedish forest industry’ (SFIF, 2019).

Actors not only operate across levels of governance to safeguard interests, but also to proactively shape policies. For example, the explicit mission of the Regional Bioeconomy Network is ‘to develop and facilitate the regions’ work with the bioeconomy, and to influence policy at national and EU level’ (Biofuel Region, 2020). Apart from illustrating how the bioeconomy is made into a regional issue, the production of regional bioeconomy statistics is an illustration of how actors identified as key in the network analysis interact across scales. The development of regional bioeconomy statistics was initiated by the Regional Bioeconomy Network. In a press release, the project manager states:

⁶ NAO is part of Sweden’s parliamentary control and conducts independent audits of performance and state finance.

The work is completely in line with my work on the bioeconomy panel, which for the next two years has been commissioned by the European Commission to support the work with regional bioeconomy strategies. That is why we are extremely happy to be able to deliver this so early in the process (Region Västerbotten, 2019).

Anticipating what is to come and providing decision-makers with advice and numbers are welcomed by recipients. At a recent webinar organised by the Royal Swedish Academy of Engineering Sciences, the chief economist of the Swedish Forest Industry Federation welcomed the regional statistics for concretising what the bioeconomy is all about, namely wood production, and not some ‘dopey’ ecosystem services (IVA, 2020). Seemingly neutral, regional bioeconomy statistics co-constitute the bioeconomy as an industrial and regional issue, enforcing the rationality of the key storylines identified.

Lastly, opposing and contesting environmental regulation is a key practice in the apparatus of capture, where strengthened private property rights are represented as a precondition for a steady supply of forest biomass. In line with the key storylines identified, the argument suggests that if Swedish forest owners are to continue caring for trees and provide biomass for the global good, they must remain free from state interference. State interference in this regard is primarily related to the implementation of environmental regulations, such as the EU Habitat Directive (Council Directive 92/43/EEC, 1992) and the inventories of woodland key habitats, which aim to identify forest habitats of particular biodiversity value. The inventories have been conducted by the Swedish Forest Agency on individual forest owners’ land since the mid-1990s to identify sites in the forest landscape with high biodiversity values (Bjärstig et al., 2019). The contestation and opposition is particularly strong among forest owner associations and representatives of the Centre Party, which is an agrarian and liberal political party. After the election to the Swedish parliament in 2018, the Centre Party made their support of the coalition government (led by the Social Democrats) conditional upon a promise that the government would strengthen private forest property rights and ensure that the forest administration would cease inventories of woodland key habitats (The January agreement, 2019 item 26).

The opposition of environmental regulation has ideological motives, suggesting that implementation of the environmental regulation may restrict forest owners’ freedom to manage their forests as they like. It also has economic motives. Environmental regulations threaten the operation of key actors of the bioeconomy network, including regional bioeconomy clusters, forest industries and major forest owner associations.

Forest owner associations have a dual role: to work for the interests of their members (individual forest owners), and to operate as large industry groups with the inherent interest of ensuring a steady supply of biomass to their industries.⁷ Considering the potential diversity of forest owners’ interests in bioeconomy development, the work in their interests can be expected to be diverse. Nevertheless, it entails a focus on fostering *active forest owners* who engage in forest management with the purpose of maximising production.

5. Discussion

This study has provided empirical insights into how and by whom the emerging Swedish bioeconomy has been shaped to date. The network analysis shows that the Swedish bioeconomy is dominated by a small group of well-connected (central) organisations, involving close cooperation between biorefinery research organisations, the forest industry and other research-industry clusters, in which regional councils have an important role. In this regard, the presence of major forest industry representatives in the network picture is similar to that found in e.g. Finland (Korhonen et al., 2018; Kröger and Raitio, 2016). The discourse analysis provides additional insight into the practices by which actors in the bioeconomy network have stabilised a cultural common sense about the direction of the Swedish bioeconomy.

Our analysis confirms existing research (c.f. Bauer, 2018; Jolly et al., 2020) and suggests that the emerging Swedish bioeconomy is a multiscale process shaped by a coalition of regional councils, research institutes, and forest industries who have used the wider bioeconomy visions as a means to reconfigure inevitable industrial adjustments as green and transformative. Through careful storytelling combining global bioeconomy narratives of innovation and substitution, with idealisation of private forest ownership and Swedish forestry, key actors in the network have mobilised support and legitimacy regionally, nationally and in the EU, and altered priorities in Swedish forest governance.

The absence of a formal process for bioeconomy development has meant that key actors in the network have been able to navigate between jurisdictions and shape the bioeconomy at multiple locations simultaneously. Here the (re)production of key storylines (substitution, technological innovation, good ownership) provides a strong cross-scale coordination of interests. The storylines are not only (re)produced by actors identified in the network analysis, but also by the major political parties of the national parliament and Swedish representatives in the European Parliament. These results confirm findings from Jolly et al. (2020) suggesting that regional councils (e.g., business officers) have been influential in shaping the bioeconomy development at national and EU level. This is distressing since some narratives e.g., on public finance, have been shown to marginalize the sustainability narratives of bioeconomy development called for by EU green policies (Albrecht et al., 2021)

Our empirical analysis has confirmed several of the characteristics typical for capture identified by Bixler et al. (2016). First, *boundaries between public and private interests are blurred* when commercial and private interests in substitution, private forest property, and in technological innovation are confused with public interests in climate change mitigation, regional and national employment, growth and competitiveness. The Good Forest Ownership campaign intentionally emphasises the public goods produced by forest owners (amenity values, carbon storage, substitution), while toning down the commercial interests in forest ownership. In addition,

⁷ Södra skogsägarna is an important shareowner of the Sun Pine biorefinery in northern Sweden; Mellanskog is the owner of Setra, one of Sweden’s largest wood products groups; Norra skog owns Norra Timber, a sawmill industry producing timber for construction purposes.

policy goals related to forest biodiversity (public, non-monetary values) are blurred with interests of the environmental movement or ‘green activism’. The diverse initiatives through which the Swedish bioeconomy has so far been shaped (e.g. innovation programme, Regional Bioeconomy Network, public advocacy campaigns such as Swedish Forests, joint events such as the Bioeconomy Parliament, regional clusters) have provided little acknowledgment of stakes in forests other than biomass production and economic revenues. These processes tend to presume that public and private interests in forests overlap and have generally provided little room for public deliberation (see also [Grundel and Dahlström, 2016](#); [Albrecht et al., 2021](#)).

Another important piece of the apparatus of capture is the way actors in the bioeconomy network (deliberately or otherwise) *stake out boundaries of what constitutes relevant and legitimate scientific expertise*. By narrowly delimiting relevant and legitimate expertise (carbon cycle, forestry, engineering sciences), the bioeconomy is turned into an issue of innovation policy – a policy area characterised by the triple helix model and less formalised networks involving industries, public actors and academia ([Grundel and Dahlström, 2016](#)). The staking out of expertise (e.g., innovative entrepreneurs, bioeconomy clusters) resembles the innovation-as-governance imaginary, where public social concerns and environmental regulation become barriers to innovation (c.f. [Doezema and Hurlbut, 2017](#)). The closed network structure characterising this imaginary is problematic from a forest governance perspective. If processes where important forest-related decisions are made (e.g., what should be changed/sustained, why, how and by whom) lack transparency, diversity and inclusivity, policy conflicts are made invisible, winners and losers are hard to identify, and the need for trade-offs concealed. To make legitimate trade-offs, finding ways to compensate those who lose out and not miss out on potential synergies between different forest values and interests, inclusivity and diversity is paramount (c.f. [Sotirov and Arts, 2018](#)).

The apparatus of capture also includes *mobilisation of emotions and polarisation* (c.f., [Leipold and Winkel, 2017](#)). Actors in the Swedish bioeconomy network rarely acknowledge and even discredit environmental science, expertise (including public authorities) and international environmental regulations, and systematically marginalise the biodiversity crisis from bioeconomy discussions. The mobilisation of scientific uncertainties and subsequent contestations highlights the importance of acknowledging and interrogating the plurality of (scientific) forest ontologies in emerging forest-based bioeconomies, and underscores the relevance of the rising ontological debate in forest governance studies (c.f. [González and Kröger, 2020](#)). To nuance and rethink the role of forests in the emerging Swedish bioeconomy, it is important that future studies focus on the marginalised actors and storylines. Future research should also look into how diverse (scientific) ontologies give actors ammunition and polarise political debates - especially if we want to understand how and why different actors resist, facilitate or impede transformative changes in forest management, which in the Swedish context has been described as crucial for sustainable bioeconomy transformation ([Bennich et al., 2018](#)).

A limitation of the present study is its narrow focus on the Swedish bioeconomy. The bioeconomy network identified in our analysis appears very Sweden-centric. Future research should explore the operations of Swedish actors beyond Sweden, and the influence from foreign actors on the Swedish bioeconomy. This is important for understanding the multiscale and cross-sector interdependencies and interactions shaping emerging bioeconomies, in Sweden and beyond.

Lastly, the formalisation of Swedish bioeconomy policy provides an opportunity to revisit Sweden’s bioeconomy and open up its closed network structure. To avoid the risks of capture, however, it is important that conflicting interests in forests are acknowledged, and that plural knowledges and forest perspectives are explored rather than obscured (c.f. [González and Kröger, 2020](#)). This can be done through careful process design, including explicit principles for participation, clear rules of the game ([Bixler et al., 2016](#); [Johansson, 2018](#)), and tools for reflective practice (e.g. on asymmetric power relations, norms, approaches to scientific uncertainties and risks) that can make plural forest perspectives visible and (ideally) allow for respectful confrontation between actors with opposed positions ([Westin, 2019](#)).

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Titles and organisational affiliations of interviewees

Innovation Programme	Circular and Biobased Economy
1.	Forest Director, Swedish Federation of Forest Industries (SFIF)
2.	Sustainability manager, Swedish Cellulose Company (SCA)
3.	Director General, Swedish Forest Agency
4.	Forest Director, Federation of Swedish Farmers (LRF)
5.	Deputy vice-chancellor, Swedish University of Agricultural Sciences (SLU)
6.	Special Investigator - Circular Economy

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7.	Union president, The Swedish Union of Forestry, Wood and Graphical Workers
8.	Research and business development manager, RISE
9.	Vice-chancellor, Royal Institute of Technology (KTH)
10.	General Counsel and Country Manager, Stora Enso
Regional Bioeconomy Network	
11.	Biofuel Region (includes Region Norrbotten, Västerbotten, Jämtland, and Västernorrland), project leader
12.	Region Halland, area manager Green Growth
13.	Region Kalmar, area manager sustainability and communication
14.	Region Norrbotten, business strategist
15.	Region Skåne, environmental strategist
16.	Region Västernorrland, sustainability coordinator and growth coordinator (interview included two people)
17.	Västra Götalandsregionen, regional developer – forest-based bioeconomy and transport
18.	Region Östergötland, innovation strategist

Appendix B. Bioeconomy events observed

Event	Date and location	Description of event	Organisers	Analyzed material
Webinar “The forest industry’s opportunities to contribute to a growing Swedish bioeconomy”	10 September 2020	The webinar aims to provide input to the development of a national bioeconomy strategy. It explores the bioeconomy concept, the forest industry’s opportunities to contribute to a growing bioeconomy, and presents the necessary preconditions for the forest industry to do so.	Royal Swedish Academy of Engineering Sciences (IVA)	Handwritten field notes from online observation
Annual conference, National Forest Programme	Stockholm, 4–5 December 2019	The goal of the annual conference was to launch a dialogue on forest use. Points of discussion were: <ul style="list-style-type: none"> – forests and private property rights – the role of forests in a growing bioeconomy and sustainable societal development – the importance of regional engagement 	Ministry of Enterprise and Innovation, Swedish Forest Agency	Handwritten field notes on site
Bioeconomy parliament (Swedish: Bioekonomiriksdagen)	21–22 March 2018, Karlstad	Two-day event aimed at developing a common understanding of strategies and necessary policy action. Described as a platform for leading organisations, key individuals, and decision-makers to meet and create solutions.	Region Värmland, Paper Province (regional forest industry cluster), Swedish Forest Industry Federation, University of Karlstad, Federation of Swedish Farmers, Bioeconomy Region, The Wood Region, Innovation and Chemical Industries in Sweden	Handwritten field notes on site
Bioeconomy forum (Swedish: Forum för Bioekonomi)	Stockholm, 17 April 2018	Gathered elected representatives, business and academia to discuss bioeconomy challenges and opportunities. Agenda focused at implications of EU policy on Swedish forest industries, and on the role of bioeconomy development in mitigating climate change.	The Swedish Forest Industries Federation (SFIF)	Handwritten field notes on site
Bioeconomy forum (Swedish: Forum för Bioekonomi)	Stockholm, 10 April 2019	Gathered elected representatives, business and academia for discussing bioeconomy challenges and opportunities. Swedish members of the European Parliament reflected on implications of EU election on Swedish forest industries. Another topic was the need to increase availability of forest biomass.	SFIF	Handwritten field notes on site
Regional Bioeconomy Network meeting	Stockholm, 4–5 September 2018	Internal network meeting. Agenda topics included a report on the role of forests in energy and climate policy aimed to serve as a knowledge base in the network, in development of regional forest strategies, and in advocacy work.	Biofuel region Region Östergötland	Handwritten field notes on site. Written material distributed by organisers to the meeting participants

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Event	Date and location	Description of event	Organisers	Analyzed material
Seminar on Region Östergötlands forest strategy.	Linköping, 17 August 2018	Seminar involving different forest stakeholders aimed at discussing the regional forest strategy.		Handwritten field notes on site

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