

Spaces of the forest-based bioeconomy in Finnish Lapland and Catalonia: practitioners, narratives and forgotten spatialities

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Over the last decade, the bioeconomy has been increasingly promoted as a strategy able to shift our economies away from fossil fuels and boost local economic growth, especially of rural areas in Europe. The bioeconomy is an important part of the European Union agenda, it is promoted through European wide strategies that are translated into local and regional policies. However, the bioeconomy does not unfold equally across regions; it has different implications influenced by the spaces and the narratives with which the policies are created and implemented. Amongst all the actors participating in the bioeconomy strategies, local practitioners play a crucial role in interpreting the narratives and implementing the policies in a way that makes sense for their local contexts. Hence, there is a need to understand how local and regional practitioners apply bioeconomy strategies to grasp how those are expressed in different regional contexts. Through the case studies of the forest-based bioeconomy in Catalonia and Finnish Lapland, this paper explains why economic narratives prevail in the local bioeconomy and how regional spatialities are affected by it. The cases show that the bioeconomy remains close to economic growth and is applied through regional economic development policies, thus focusing on specific economic sectors and hindering the role of the bioeconomy in a wider regional transformation. Understanding the narratives and how these reflect the spatialities help us to advance a spatially sensitive approach to the bioeconomy, this is, a bioeconomy practised according to the socio-spatial conditions, closer to ideas of inclusivity, plurality and justice, and with a greater role in a wider regional transformation, rather than the greening of specific economic sectors.

Keywords: bioeconomy, forest industry, regional development, place specificities, narratives

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Introduction

By promoting the bioeconomy, the European Union advocates for a technological and economic change to address climate change, and reaffirms its intention to maintain a leadership position in the transit towards a fossil fuel free society (European Commission, 2012, 2019). The first European bioeconomy strategy was published in 2012 and, since, it has been modified and criticised for not addressing issues of ecological sustainability and social inclusiveness. The conversation about an inclusive and sustainable bioeconomy has started (Fritsche *et al.* 2020), however, a sustainable and inclusive bioeconomy remains vague and challenges the capacities and innovation of local actors in charge of materialising the strategy (Morales & Sariego-Kluge 2021).

Critical voices in the bioeconomy highlight its unquestioned rush to support growth and innovation without addressing issues of environmental and social justice, and disregarding activities that portray a human-nature relationship without a clear economic benefit (e.g. Schmidt *et al.* 2012; Mustalahti 2018). Part of what these critiques claim is that the spatialities with which the bioeconomy interacts are often overlooked and, despite the attempts for promoting an inclusive and sustainable bioeconomy, elements of sustainability and inclusion remain vague. In this paper, I refer to spatialities as the social, economic, cultural and natural processes that constitute the spaces inhabited and lived (Walker 2009; Merriman *et al.* 2012).

By comparing how local practitioners understand and conceptualise the bioeconomy policies, and by examining the narratives with which it is reproduced in Lapland (Finland) and Catalonia (Spain), I argue that even if the conceptualisations tend to place the bioeconomy as a wider process of regional sustainable transformation beyond industries, some of the spatialities where it is applied are largely overlooked. This because the policy strategies used to implement the bioeconomy remain strongly linked to regional economic growth, imposing economic growth views over other ways of understanding the bioeconomy. The case studies show that those narratives favour the transition of specific economic sectors but hide diverse socio-spatial configurations and, ultimately, downplay the role of the bioeconomy in a larger regional transformation (understood as a larger societal transformation that includes as much industrial modernisation and economic growth as civil society participation, social innovation and environmental justice). Empirical studies explaining how local and regional actors interpret and adapt green policies are still scarce (Amundsen & Hermansen 2020), and with this paper I intend to contribute to this debate. I begin with an overview of the multiple definitions given to the bioeconomy, paying special attention to the branch of the bioeconomy based on forest resources, as it is the dominant type of bioeconomy in Lapland, and gaining relevance in Catalonia. Then I continue to the methodological and data collection strategies, followed by an explanation of the narratives and how these reflect and conflict with the spatialities. Conclusions can be found in the last section.

Bioeconomy: narratives and conceptualisations

The bioeconomy is a long existing concept interpreted in multiple ways, from ecological economy, industrial biotechnology to biomass-based economy replacing fossil fuels (Vivien *et al.* 2019). According to the European Commission, the bioeconomy is the part of the economic processes that covers all sectors and systems relying on biological resources (animals, plants, microorganisms and derived biomass). It encompasses economic activities of primary production, such as agriculture and forestry, plus all sorts of industrial sectors that use biological resources to process food, energy or biotechnology, providing elements to substitute fossil fuels (European Commission 2018; Fritsche *et al.* 2020).

The literature analysing the narratives in the bioeconomy is rich, as the narratives are (e.g. Schmidt *et al.* 2012; De Besi & McCormick 2015; Birch 2016; Bugge *et al.* 2016; Bauer 2018; Ramcilovic-Suominen & Pülzl 2018; Vivien *et al.* 2019; Befort 2020). Accordingly, narratives seem to juggle between bioeconomy as biotechnology, use of biomass, economic growth, sustainability, competitiveness, sectoral capacities, technological fixes, industrial biotechnology, as well as opposing (yet complimentary) non-technological conceptualisations, inclusiveness and limits to biomass (Befort 2020). Within this variety of approaches, I focus on those narratives directly related to the use of forest biomass: bioeconomy and economic growth, and bioeconomy as a regional transformation.

Forest-based bioeconomy and economic growth

The forest based-bioeconomy (F-BB) is a popular concept amongst northern Europe and countries with a strong prevalence of the forest industry (Pülzl *et al.* 2017). It is broadly defined as the use of forest biomass to replace fossil fuels through the means of innovation and technological development (Wolfslehner *et al.* 2016). The F-BB is often promoted as an opportunity to gain regional competitive advantage by exploiting an underutilised resource (Pülzl *et al.* 2017), while creating alternatives to transition away from fossil-fuels and modernising the forest industry (Pülzl *et al.* 2014).

The F-BB has been criticised for taking economic growth and environmental sustainability for granted and assuming a positive impact on regional development by creating new jobs (Schmidt *et al.* 2012; Ferguson 2015; Ramcilovic-Suominen & Pülzl 2018; Vargas-Hernández 2019). Some argue that the F-BB remains mostly concerned about the economy and its policies are focused on efficiency, productivity and industrial competitiveness, while concerns about sustainability are often used as selling points (Ramcilovic-Suominen & Pülzl 2018). The F-BB is also criticised for focusing on the role of regional innovation systems (comprised by governments, firms and universities), while leaving aside crucial social actors such as civil organisations, conservation groups, citizens and consumers (Kitchen & Marsden 2011; Grundel & Dahlström 2016; Mustalahti 2018).

Forest-based bioeconomy as regional transformation

Behind the concerns about the excessive focus on economic growth, is the acknowledgement of the bioeconomy as part of a wider regional transformation that includes societal, economic and cultural aspects, and not limited to technological changes (Kemp & Never 2017). Critical voices often call for acknowledging the bioeconomy's role in a transformation towards sustainable regional economies (Bauer 2018; Albrecht *et al.* 2021; Andersson & Grundel 2021). However, the F-BB is embedded in uneven power relations that can undermine its role in such wider transformation. Powerful corporate interests can determine the use of natural resources in geographically remote rural areas and co-opt the bioeconomy narratives, as seen in Finland (Ahlqvist & Sirviö 2019) and Sweden (Holmgren *et al.* 2022).

The bioeconomy is also a contested policy concept that encompasses a diversity of imagined futures and is able to produce transformations at a regional scale (Bauer 2018). Bioeconomy strategies contain imagined visions of what the future should be, as well as the set of policies, strategies and institutional arrangements needed to achieve those imaginations (Schmidt *et al.* 2012; Birch 2016). The F-BB is often promoted through public agencies in charge of agriculture, rurality and forestry, where it is portrayed as a solution for rural unemployment, sluggish modernisation and depopulation (European Commission 2018; Fritsche *et al.* 2020). Furthermore, both the European Commission and the Finnish national bioeconomy strategy portray the bioeconomy as a solution to the environmental crisis and the uneven development of rural regions (Ministry of Agriculture and Forestry of Finland 2014; CTCF 2018; European Commission 2018; Fritsche *et al.* 2020). To achieve those goals, the F-BB endorses the use of existing assets locally available, in order to boost production and industrial modernisation.

The way how the narratives described above are grasped and reproduced by those in charge of creating and implementing the policies locally, play a key role in determining whether the spatialities in which the F-BB interact are reflected or not (Amundsen & Hermansen 2020). I will explore this argument in the following sections.

Methods and cases

The question guiding this analysis is: are the spatialities with which bioeconomy policies interact reflected or overlooked in its narratives, as identified by the practitioners (the people in charge of design and implementation of the bioeconomy polices regionally)? To do so, a case study and qualitative analysis was used to pinpoint the narratives and strategies with which regional practitioners grasp and apply bioeconomy strategies, to then contrast them with the place specific conditions of each region. The cases were selected for having an active bioeconomy strategy with focus on rural development, yet different in their institutional, economic and social contexts (see Seawright & Gerring 2008).

After identifying potential regions that fulfilled the requirements mentioned, and accounting for practical reasons such as pre-existing networks and language, Catalonia and Finnish Lapland were chosen (Fig. 1). Another reason to study these two regions was that their F-BB practitioners are engaged in processes of policy learning with each other, through field visits, conferences and other exchange platforms (Albrecht *et al.* 2021). They have collaboration efforts to do research and raise funds from the European Union and are especially active in the network of F-BB practitioners in Europe (Andersson & Grundel 2021).

Location of Catalonia and Lapland

- Finland
- Lapland
- Spain
- Catalonia

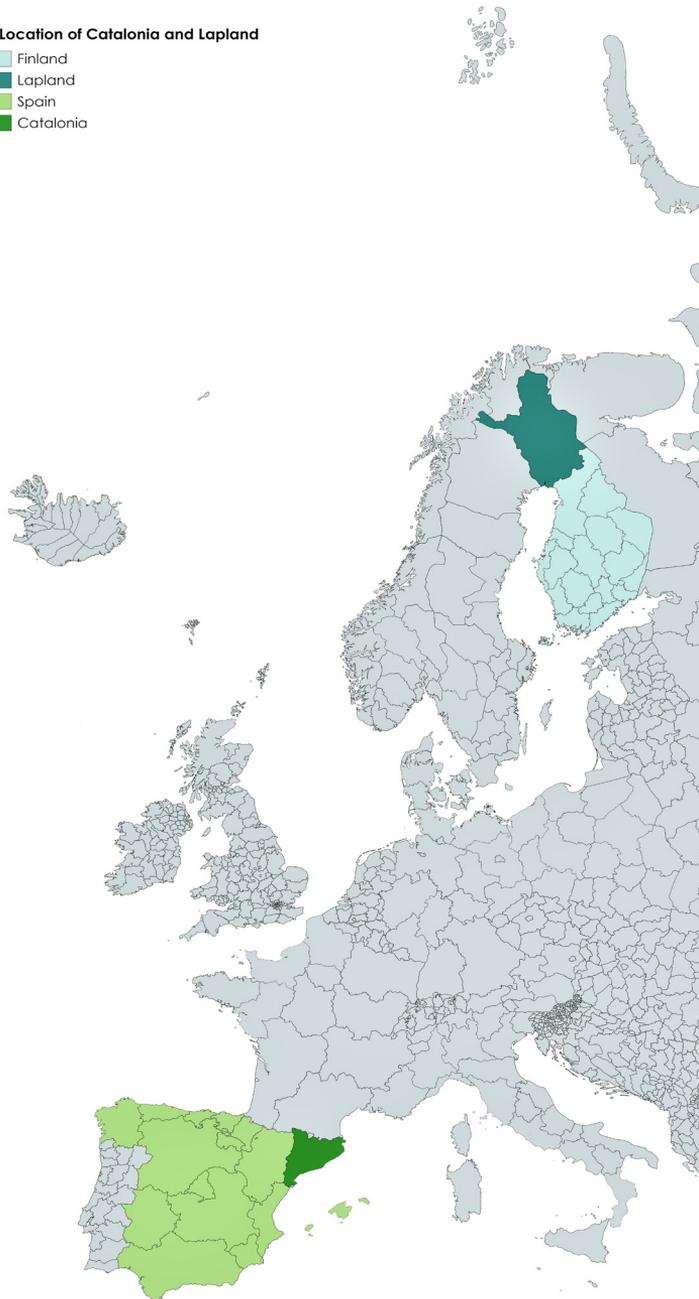


Fig. 1. Finnish Lapland and Catalonia.

The empirical material analysed comes from a broader project looking at the development of bioeconomy strategies in European regions. One of the project objectives was to understand the narratives and spatialities of the bioeconomy strategies, which I am addressing here. This paper is supported on primary and secondary data. Primary data was crucial to obtain in-depth information about how local practitioners apply the bioeconomy and the narratives that help shaping their decisions. It comprises participant observation in meetings, presentations and conferences where practitioners and policy makers linked to the bioeconomy in Catalonia and/or Lapland shared their experiences and forthcoming agendas. These encounters occurred during 2019 and 2020 both face-to-face and online. Additionally, 15 semi-structured interviews, conducted virtually and *in situ* during March, April and May 2019 in Barcelona, Girona, Solsona (Catalonia), and Rovaniemi (Finnish Lapland), inform the results presented here (Table 1). The interviewees were selected because of their active involvement in implementing the bioeconomy strategies at regional and national scale. In general, the questions were directed at understanding how each participant understands the bioeconomy, how it is implemented and what challenges and opportunities they encountered.

Table 1. List of interviews.

Identifier	Interviewee
Interview 1	Entrepreneur
Interview 2	Director, Catalonia Landscape Observatory
Interview 3 (2 participants)	Consultancy firm Sectorial coordinator, ACCIO
Interview 4	Innovation Board Strategic Manager, Technology development centre
Interview 5	Circular economy coordinator, ACCIO
Interview 6	Technician, area of bioeconomy and governance, CTFC
Interview 7	Director, CTFC
Interview 8 (3 participants)	Director, National institute for agriculture and food technologies INIA Professional, INIA Professional, INIA
Interview 9	Entrepreneur
Interview 10	Senior expert in research and Innovation support services, Univ. of Lapland
Interview 11	Future bioeconomies manager, Lapland University of Applied Sciences
Interview 12	Expert in international affairs, Lapland Regional Council
Interview 13 (3 participants)	Business advisors for small Enterprise and farmers, Proagria Companies expert, Proagria
Interview 14	Researcher, National Resources Institute Finland Luke
Interview 15	Arctic Smart Rural Community deputy manager, Lapland Regional Council

The secondary data was obtained from various sources and includes reports, scientific publications, conference observations, websites, social media platforms, and policy reports from different scales (European Union, research organisations from the European, Spanish and Finnish level, national policies, and public and private research centres reports from the national and regional level). The secondary data was crucial to obtain information about the European, national and regional bioeconomy strategies and plans as seen from the different scales.

To identify how practitioners shape the bioeconomy regionally, I conducted an analysis based on interviews, notes from participant observations at conferences and meetings, and policy documents on the bioeconomy. The data was manually coded and then categorised in N-VIVO. Two types of coding were used. First, based on characterisations of the bioeconomy found in the data and previous research, terms such as growth, jobs creation, rural development and opportunities, constituted the first set of codes. These were extracted and prioritised according to how many times the thematic was referenced and classified according to the data source (practitioners or reports from industry-related fields, local governments or landscape and rural development agencies). The most repeated and cross-referenced the code, the most prevalent the term. The second set of codes correspond to place specific conditions, codes such as peripheries, access to forests, fires and forest growth management, energy supply, were extracted giving priority to primary sources. With these two sets of codes and referenced data, the analysis consisted on identifying prevalent narratives (code set 1) and contrasting them with place specificities (code set 2).

The following section presents the bioeconomy strategies in Catalonia and Lapland and explains the narratives with which the bioeconomy is portrayed, while pinpointing the place specificities that shape the bioeconomy as a public policy (industrial Catalonia, rural Catalonia, urban Catalonia, industrial Lapland, forestry Lapland, rural and indigenous Lapland).

Results¹: narratives and spatialities

Catalonia

Catalonia is a region of contrasts, with both a high and low population density (over 400 inhabitants per square km and less than 10 inhabitants per square km) (CTFC 2018). The urban and rural divide is evident; while urban areas keep growing, rural areas face depopulation and land abandonment. This has contributed to the growth of Catalanian forest, now covering around 70% of the region (*ibid.*). Some argue that this creates a good opportunity for the forest-based bioeconomy, while others are concerned with the lack of management and risk of fires (interviews).

The bioeconomy public policy landscape in Catalonia is shaped by first, the European strategy (European Commission 2018). Second, the individual actions that different public organisations have designed according to their competences, scope and the Spanish bioeconomy strategy to a lesser extent (Gobierno de España 2018). According to the interviewees, the rationales to promote the bioeconomy in Catalonia are the incentives given by the European Union, regional actors' perception of the opportunities that the bioeconomy represents, and the acknowledgement of environmentally unsustainable practices. Catalonia does not have one regional bioeconomy policy, but a collection of plans dispersed amongst different public agencies applying the bioeconomy according to the population and economic sectors within their competences. Hence, the bioeconomy is referred to as circular bioeconomy when tailored to industrial production, or forest-based bioeconomy when targeted at the use of forest biomass. Here, the focus is set on two agencies that are taking leadership in promoting the Catalanian bioeconomy. First, the regional agency in charge of promoting innovation and competitiveness amongst firms and businesses ACCIO (based in Barcelona), and, second, the Forest Science and Technology Centre of Catalonia CTFC (based in Solsona), a public consortium created in cooperation with local universities and governments.

ACCIO representatives interviewed emphasised the importance of promoting the bioeconomy amongst the economic sectors that already have potential to transform biomass efficiently, the chemicals industry for example, thus creating wealth by utilising the region's industrial competitive advantages (infrastructure, large internal markets and capacities to reach external markets). This side of the Catalanian bioeconomy is more linked to industrial policies². It aims to improve the social perception of the regional industries while promoting innovation, efficiency and circularity. For ACCIO, the bioeconomy and the circular economy are complementary approaches, the bioeconomy provides renewable resources and the circular economy maximises their use. Therefore, seen from ACCIO, narratives of industrial modernisation are prevalent and applied to an industrial spatiality. The dominant narrative here is the modernisation and circularity of Catalanian industries through

innovation to “use natural materials and keep them in the loop the longest possible (...), using local biomass and managing the waste created” (interview 3).

On the other hand, CTFC aims to “contribute to the modernization and competitiveness of the forest sector, to promote rural development and the sustainable management of the environment” (Centre de Ciencia y Tecnologia Forestal de Catalunya n.d.). CTFC is divided into six areas, one of which is dedicated to bioeconomy and forest governance (other areas include biodiversity and conservation). The bioeconomy is conceptualised as the use of renewable biomass to add value to forest products while contributing to decarbonise the economy, similar to ACCIO, but building over an underdeveloped economic sector (forestry). The dominant narrative, seen from CTFC, is industrial path creation in a rural spatiality that lacks competitive advantages and faces challenges of depopulation, unemployment and poor accessibility. The Catalanian F-BB remains in a nascent stage, partly explained because forestry is not a relevant economic sector for the region, and because the region’s socio-economic dynamics are not strongly shaped by its inhabitants’ relationship with the forests (except from some traditions for example mushroom picking in autumn). Most of the population live in cities, separated from their natural surroundings as if “the end of the city was also a closed door to outer spaces” (interview 1).

The type of strategies to promote the bioeconomy depend on who has designed them, and who is the target. The strategies designed by ACCIO target industries and business of all sizes, aiming to promote innovation and collaboration between private actors. Some examples are: i) Providing grants for firms to reach technological and research centres and to develop circular economy solutions, either individually or collectively; ii) Helping firms to find external funding for research and development, iii) Collaborating with other regional agencies to obtain additional resources for the grants scheme, and iv) Collecting and documenting good practices and successful examples to share with firms. The strategies designed by CTFC are aimed to strengthen the research carried out in the centre, find external partners and create networks, and exchange knowledge with other actors working in the forest-based bioeconomy. Some examples are: i) Conducting research about potential uses of Catalanian forests; ii) Collaborating with other regional agencies interested in rural development to, for example, create circular solutions to agricultural production, iii) Organising conferences with European partners, and iv) Keeping an active networking with European organisations aiming to become a reference point of the forest based-bioeconomy in Southern Europe.

To summarise, ACCIO is driven by an industrial modernisation and circular economy narrative that promotes the use of existing advantages of Catalonia’s industrial spatiality. Those advantages include having a diverse industrial sector, infrastructure and knowledge production centres that can push technological changes, and a large local market and international networks. Their approach is that of an industrial transformation that relies on innovation and technological changes, boosted by strong industrial development. CTFC, on the other hand, is driven by a narrative of rural economic growth and path creation for a rural spatiality characterised by abandonment, lack of jobs and abundant and underutilised natural resources. The forest-based bioeconomy becomes an “opportunity to increase the competitiveness of the [underdeveloped] forestry sector” (interview 6), integrating economic growth with forest management and biodiversity conservation, “processing biomass and managing environmental services and biodiversity, both sides of the same coin” (interview 7).

Lapland

Lapland is the northernmost region in Finland and has low population density (1.8 inhabitants per square km). It is mostly a rural region, even “in this café in the middle of Rovaniemi, we are in the rural area” (interview 12). Similar to Catalonia, the forest continues to grow beyond the annual harvesting volumes (Viitanen & Mutanen 2018; interviews), but, in contrast, the regional socio-economic dynamics are profoundly linked to the forest because of the forestry and tourist industry (which, alongside mining, dominate the regional economy), leisure activities, and ancestral traditions and knowledge carried by Sami communities and local inhabitants (Arctic Smartness n.d.; Lapland University of Applied Sciences 2019).

The bioeconomy policy landscape is bounded within the Finnish National Bioeconomy strategy and the Lapland’s smart specialisation strategy called Arctic Smartness (Regional Council of Lapland n.d.; Ministry of Agriculture and Forestry of Finland 2014). The Finnish bioeconomy strategy pinpoints

Finnish forest industry strong position in global markets, Finland's natural advantages (forestland and fresh water), and its people's close relationship with their forests. Arctic smartness, on the other hand, has become a priority for regional development and an important tool of place branding. Based in these policies, the strategies to promote the bioeconomy, although vary depending on who is targeted, aim to promote research and innovation, gain and maintain recognition at the European level, and to endorse the F-BB as a regional branding. Some examples are: i) Connecting customers with local food producers, and local producers with the tourist industry and public kitchens, ii) Visiting rural villages to explain the benefits of the forest-based bioeconomy, and the forms in which rural entrepreneurs can get involved, iii) Promoting entrepreneurship based on existing forest and mining industries, iv) Connecting researchers with industries, and v) Updating educational curricula with bioeconomy and opening postgraduate programs with applied research.

Arctic Smartness is divided in five clusters, two of which are relevant for the forest-based bioeconomy: The Arctic Smart Rural Cluster (rural cluster hereafter), and the Arctic Industry and Circular Economy (industrial cluster hereafter). The rural cluster targets rural inhabitants, entrepreneurs and micro-enterprises. It is managed in collaboration between the regional council and Proagria, a cooperative organisation integrated by rural communities and entrepreneurs with national presence and regional branches. The rural cluster conceptualises the bioeconomy as the entrepreneurial activities carried out by rural inhabitants (interviews 13 and 15). From their perspective, rural businesses in Lapland have been always practicing the bioeconomy, as they already work with agriculture and forest products. The concern is the creation and survival of rural businesses and villages.

[The rural communities cluster] is a different bioeconomy, because the companies are smaller, sometimes one-person companies. We do not want to be so dependent on the national energy grid, or the national food businesses, or imports of food if we can produce it here (...) that is what I understand by the bioeconomy. (interview 11)

As the quote shows, the rural cluster supports the production of local food (aiming for a 30% of local consumption to come from local producers), and the establishment of biogas refineries and other local solutions to energy and heating that use the natural resources available (Arctic Smartness n.d.). Practitioners involved in the rural cluster are driven by an economic development narrative applied to a rural spatiality where entrepreneurs already practice the bioeconomy but need support to guarantee income and survival of their businesses, while villages need support to take ownership of energy and heating systems, improving their finances by decreasing their expenses.

On the other hand, the industrial cluster targets the larger economic actors in the region (steel and forestry industries), and related SMEs. The cluster is hosted at Digipolis OY, a technological centre located in the Kemi-Tornio sub region (southwest, frontier with northern Sweden). This area alone holds 80% of Lapland's industrial production (interviews). Digipolis gathers more than 50 companies (including forestry multinationals, energy companies, biorefineries, research centres, corporate health, inspection and testing companies, amongst others), working as an industrial agglomeration that facilitates innovation and industrial collaboration (interview 12). It also hosts the Circular and Bioeconomy centre, a project supported by the Finnish Innovation Fund (Sitra), with essentially the same goals as the cluster (industrial symbiosis, use of side streams, innovation, entrepreneurship). The industrial cluster conceptualises the bioeconomy as the activities carried out by larger industries (interview 10), aiming to promote innovation and collaboration, circular solutions and innovative ways to modernise production (interview 12). Their concern is that the arctic industry's production systems are circular and more efficient while more economic actors can create businesses by taking advantage of side streams. Practitioners involved in the industrial cluster are driven by an industrial modernisation narrative applied to an industrial spatiality dominated by the forestry industry.

Discussion: reproducing the economic of the bioeconomy

The F-BB in Catalonia and Finnish Lapland is dominated by narratives of modernisation, industrial development, creation of jobs, income, creating value and entrepreneurship opportunities. This mirrors what other research concerned with the narratives in the bioeconomy have found. Despite the bioeconomy's potential to drive inclusive and sustainable transformations, its most relevant

feature is its presumed ability to foster regional economies, remaining at odds with environmental sustainability and human-nature interactions that do not create monetary value (Schmidt *et al.* 2012; Mustalahti 2018; Ramcilovic-Suominen & Pülzl 2018). The following section explains this argument.

This is about the economy!

This is not about politics, it's about the economy (...) about the numbers and data, not the arguments but the facts. (interview 13)

While environmental ethics and climate change are usually acknowledged as the main rationale for the bioeconomy in the European, Spanish and Finnish strategies, the need to reconcile sustainability with economic growth and regional competitiveness is always stressed. This is reproduced by the practitioners, who see the F-BB as an alternative to address climate change while gaining competitive advantage and promoting regional growth.

From the practitioners' point of view, the bioeconomy is both a process of modernisation and a process of rural economic development. Accordingly, the F-BB is implemented in industrial and rural spaces based on socio-economic interactions and acquires distinct connotations. Lapland's economy, argue the interviewees, has always been a bioeconomy because their culture and economic activities have revolved around the forests. As one interviewee puts it, "you can't just go to a farmer and tell them about bioeconomy just like that, also, that is something they have been doing for 100 years!" (interview 13). The F-BB involves a multiplicity of spatialities (including economic but also cultural and environmental processes shaping rural spaces) and actors (including farmers, family businesses, villages, the tourist and the forest industries). Yet, the main concern is how to make the forest industry circular and more efficient and how to ensure the survival of rural businesses and villages. The bioeconomy applied to rural spaces is carried out by rural inhabitants who need support to participate in profitable economic activities utilising forest resources. On the other hand, the bioeconomy applied to industrial spaces is carried out by larger and more powerful economic actors looking for support for modernising and greening their production.

As explained, in Lapland the F-BB strategy is contained in the regional policy for smart specialisation. The practitioners see smart specialisation as beneficial because it promotes the greening of large industries and because it creates spaces for involving more actors in profitable economic activities. However, even if Arctic Smartness has been influential in path development and place branding to attract private investment and European Union funds, its contribution in promoting a wider sustainable transformation remains unclear (interview 9, meetings proceedings). Widening the actors who benefit from the bioeconomy is a significant progress towards reducing spatial unevenness, yet, a shortcoming of smart specialisation is its blindness towards other forms of social interaction with the forests, non-profitable activities, sustainable use of resources, forest governance, and traditional knowledges, as pointed out by the bioeconomy critics outlined in the literature review. In addition, there is little said about the actual sustainability of the bioeconomy, how can it coexist with other economic and non-economic activities, or how it can benefit from the contributions of traditional knowledges. Indeed, as the interviewees pointed out, the participation of Sami communities in the bioeconomy has been rather limited (interviews 11 and 13). To summarise, applying the bioeconomy through smart specialisation in Lapland does not solve the critiques amply made by previous research. Rather, it reduces rural spatialities to economic constructs and sustainable development to industrial modernisation (Gibbs & O'Neill 2017; Vivien *et al.* 2019; Befort 2020).

On the other hand, the Catalanian bioeconomy either builds over already established industries or promotes the emergence of a new sector. It pushes technological breakthroughs using an existing robust network and infrastructure, or the development of an economic sector by maximising the use of an abundant resource that needs to be managed. Thus, the bioeconomy is either a strategy for rural economic growth via innovation or a tool of industrial modernisation. A strategy of industrial modernisation focused on circularity and practiced by larger economic actors, or a strategy for rural economic growth that is expected to add value to the Mediterranean forest biomass, creating more income for forest owners (largely private individuals with small plots of abandoned land) while improving forest management.

The bioeconomy is often criticised because sustainability is not implicit. Truth is, the bioeconomy is not necessarily sustainable but it is sold as a way to transit towards sustainable economies, but at the end you are doing more of the same, and even worse because the use of biomass is more intensive. (interview 6)

The Christmas [tourist] season starts earlier and earlier each year, and we are waiting for snow desperately at the beginning of the season (...) there are not enough discussions about climate change, it is very short-term thinking. (interview 9)

The quotes show practitioners' awareness about the shortcomings of implementing the bioeconomy with a strong economic narrative. The problem is not that the role of the bioeconomy in sustainability and inclusiveness is unknown, but that those narratives remain less visible in the practice of the bioeconomy. Both Catalanian and Lapland's interviewees acknowledged that business as usual scenarios are insufficient to address the environmental crisis. They also acknowledged the importance of conservation and the large variety of uses for forests, including activities where commodification is not yet occurring amply (for example, berries and mushroom picking). But even in these cases, the activities that receive more support are those that imply economic revenue, like ecotourism. Practitioners intend to diversify the bioeconomy to reflect the spatialities and integrate the different uses of forest, but these efforts require greater support that, by the time that this research was conducted, was not provided.

Narratives of the bioeconomy as a process of economic growth and regional transformations may appear complementary; however, when grounded, they can turn contradictory and create spatial unevenness (see Ahlqvist & Sirviö 2019). This because the narratives with which practitioners design and apply the bioeconomy create stories of 'success', becoming the ones that turn into public policies and receive more funding (Albrecht *et al.* 2021). Those stories promote pathways, actions, strategies, and interventions to enable the desired outcomes (Bauer 2018). They privilege economic over other types of social, cultural and natural processes, and pose deep implications for rural spaces. Indeed, rural spatialities can be reduced to become suppliers of biomass and containers of technology, industries and infrastructure, while reinforcing the idea of a unique path to achieve sustainable development (Giddings *et al.* 2002; Ollikainen 2014; Ferguson 2015; Ramcilovic-Suominen & Pülzl 2018).

Clusters and innovation

The prevalence of economic narratives in the bioeconomy has been pointed out in previous research. In this section I intend to expand this argument by explaining how that prevalence is partly explained by the set of policies and strategies that the practitioners and regional authorities have at hand to implement the bioeconomy. These policies and strategies, including for example incentives for innovation and entrepreneurship, regional branding to attract private investment, and support for clusters and other forms of private collaboration, are typical for the promotion of economic development, but do not address concerns of sustainability, social or environmental justice. Thus, even if the bioeconomy is conceptualised as a wider regional transformation, the strategies with which it is grounded have an economic lens that do not see beyond creating economic value.

We have grants of 6000 euros, we promote collaboration with technological centres with grants of up to 100.000 euros, and we promote R&D in firms with circular economy projects with grants of up to 500.000 euros if done in collaboration. These instruments are co-financed with the department of territory and sustainability and the waste agency. (interview 3)

The Catalanian bioeconomy means strengthening and modernising industries with a geographical connection to the region (such as production sites, headquarters, offices, subsidiaries, or R&D centres). It also means boosting an underdeveloped economic sector to promote economic development and forest management in rural areas. As shown in the quote, most of the ACCIO strategies include providing grants and collaborating with other regional public agencies to coordinate efforts and raise funds. On the other hand, CTFC, being a research centre, invests in research and innovation from within or in collaboration with other universities or partners from other European regions. Each

agency focuses on distinctive economic sectors that define how the bioeconomy is understood, shaping the interactions with other actors outside the traditional regional innovation systems (universities, firms and governments), namely consumers, providers, suppliers and rural communities.

In Lapland, the bioeconomy is promoted by the regional government under the smart specialisation program. The strategies chosen to coordinate the policy implementation are clusters, agglomerations where relevant actors are provided with spaces for innovation and collaboration. It puts together firms and researchers connected to the forestry industry, expecting to develop entrepreneurship and innovation further.

As a result of the smart specialisation program, we [we found that] clustering is the best approach to find [and address our] priorities, not [sic] all is smart specialisation, that is a wider concept, but it helps to find those most emerging and promising collaborations. (interview 12)

A crucial difference between Catalonia and Lapland bioeconomies is found on the bet for creating and incentivising agglomerative economies (clusters). While Catalanian bioeconomy can rely on a strong regional economy and industrial development, Lapland's bioeconomy requires bigger efforts of organisation and agglomeration. Due to the size, diversity and global character of Catalanian economy (biorefineries, extensive research and development centres and large local and international markets), the bioeconomy is implemented through direct promotion of private innovation and entrepreneurship to produce greener goods. On the other hand, the Catalanian F-BB is led by a sole actor with multiple roles. It has the job to innovate, create the markets and liaise with stakeholders, forest owners, and civil society organisations to strengthen forest governance and promote the bioeconomy as a feasible solution for the forest industry and management. The Catalanian F-BB, however, is expected to benefit from the region's strong regional economy and extensive markets. In Lapland, the understanding of regional economies as clusters of prioritised economic activities dominates the discourse, programs and collaborations. Arctic Smartness has become not only the main strategy for implementing the bioeconomy, but a central strategy of local and regional economic growth that occupies a great part of the regional practitioners' agenda. From the practitioners' perspective, the bioeconomy through smart specialisation is an attractive alternative for smaller and geographically remote regions.

Programs such as smart specialisation, clustering, innovation, grants and collaborations to obtain funds are all typical strategies to promote regional economic development (see Gibbs 2000). As the practitioners pointed out, narratives and policies of regional economic development, growth, industrialisation, entrepreneurship and innovation, are seen as 'easier' to materialise. The promotion of new economic geographies for production (industrial symbiosis and collaborations) and institutional arrangements (cluster or other forms of agglomeration), are attractive strategies insofar they offer solutions through actions relatively easy to implement (tax breaks, incentives to innovation, spatial redistribution and proximity) (Gibbs 2000; Kitchen & Marsden 2011). Also, results measured in terms of how many jobs are created, how many mills are transformed, how many new biorefineries were built, how many new industrial collaborations, innovations, and new businesses, are the most salient and easier to measure. However, these strategies and measures of success often overlook deeper reflections on the relationships between society, the environment and the economy (Giddings *et al.* 2002, interviews 2 and 7), as well as the different layers and interactions that comprise the spatialities with which the bioeconomy will interact. As a result, the bioeconomy becomes a policy of sectorial and industrial trans-formation with questionable sustainable credentials that do not see beyond creating economic value.

Conclusions

This paper provides material to unpack the spatialities with which the bioeconomy interacts and to reflect on the processes of implementing the bioeconomy as a policy concept. To answer whether the spatialities of the bioeconomy are reflected or overlooked in its narratives, and how this plays a role in a wider regional transformation, I analysed the bioeconomy strategies in Catalonia and Finnish Lapland as portrayed by its practitioners. Table 2 summarises the areas prioritised and overlooked within economic narratives of the bioeconomy.

Table 2. Summary of identified areas within the rural and industrial spatialities within the bioeconomy.

	Bioeconomy in	
	Rural spatialities	Industrial spatialities
Prioritised areas in economic growth narratives	Creation of jobs Modernisation Infrastructure Natural resources Income for rural inhabitants	Creation of jobs Modernisation Infrastructure Natural resources Greening of forestry and other industries Agglomerations and collaborations Circular production
Overlooked areas in economic growth narratives	Non-economic relations with nature Local and traditional knowledges Conservation and biodiversity Spatial unevenness Environmental justice	Sustainable use of resources Conservation and biodiversity

When the bioeconomy is understood as a policy concept able to create imagined futures, the narratives become powerful tools to shape the transformation process (Birch 2016; Bauer 2018). Successful narratives (or desirable imaginations), are supported while less successful ones are left with little support. The case studies show that dominant narratives of economic growth and industrial modernisation, facilitate the transition of specific economic sectors but hide diverse socio-spatial configurations and, ultimately, downplay the role of the bioeconomy in a larger regional transformation. That prevalence is partly explained by the set of policies and strategies the practitioners have at hand to implement the bioeconomy. Having no more tools than those traditionally used for regional economic growth, even if the bioeconomy is conceptualised as a wider regional transformation, the strategies with which it is grounded have an economic lens that do not see beyond creating economic value.

Questioning the dominant narratives and the strategies that apply and reproduce them is relevant when it comes to implementing the F-BB, as the impact on rural areas can be profound. The bioeconomy proposes a route for rural development: that forest biomass can replace fossil fuels and other materials to address climate change while stimulating economic growth, rural development and the modernisation of the forestry industry. These narratives endorse imagined futures of rural spatialities that are not only too narrow in how non-urban spaces and nature are perceived. They also overlook local knowledge, the role of farmers, indigenous communities and other rural inhabitants in rural development (see Schmidt *et al.* 2012; Mustalahti 2018).

To finalise, this paper is limited by not accounting for local conflicts likely to occur when different economic actors compete for the same natural resources. A future research agenda includes questioning the relationship between the bioeconomy and local knowledges, lives and experiences. Several questions remain. What kind of conflicts can emerge from an increased demand for biomass, what is the impact of a forest-based bioeconomy in regional labour markets, or how to govern the bioeconomy and biomass production when its supply depends on a multitude of actors (farmers, landowners, states, corporations)? Addressing these kinds of questions is key to keep advancing our knowledge about sustainable transformations.

Notes

¹ More details about the strategies and policies in Catalonia and Finnish Lapland can be found in Morales 2020a, 2020b.

² The smart specialisation strategy RIS3CAT, the regional industrial pact, the green and circular economy strategy, eco-design strategy and the waste prevention and management program PRECAT 20.

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