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Blue bioeconomy localities at the margins: Reconnecting Norwegian seaweed farming and Finnish small-scale lake fisheries with blue policies

Moritz Albrecht
Department of Geographical and Historical Studies, University of Eastern Finland, Joensuu, Finland

Jani Lukkarinen
Department of Geographical and Historical Studies, University of Eastern Finland, Joensuu, Finland; Finnish Environment Institute, Environmental Policy Centre, Joensuu, Finland

Abstract

The blue bioeconomy is gaining momentum in EU policy debate and various national government strategies as a pathway towards a more sustainable society. Linked to the circularity of economic processes, it combines the promise of (regional) economic development with a sustainable, bio-based transition focused on increased and novel utilisation of aquatic resources. Nonetheless, portrayed as a holistic approach, the political visions of blue bioeconomy reside predominantly in marine environments with little integration of freshwater perspectives or alternative development paths. Rooted in concepts of policy mobility, assembling processes and the positionalities of involved entities, this paper displays two regionally embedded blue bioeconomy developments – Norwegian coastal seaweed farming and Finnish lake fisheries – and their spatially diverse reconnections with national and international policy narratives. By framing a freshwater and a coastal marine case, and their spatial reconnections with an overarching yet diversely translated policy realm, the paper taps into the multiple ontologies of water in blue bioeconomy governance and presents initial empirical and methodological steps towards a relational understanding of its governance processes. Based on four key topical reconnections, the article points to a variety of challenging mismatches between policy narratives, local development processes and potentials. It also suggests conceptual and methodological implications of this approach for further research into "blue" resource governance.

Corresponding author:
Moritz Albrecht, Department of Geographical and Historical Studies, University of Eastern Finland, Joensuu Campus, Yliopistokatu 7, 80101 Joensuu, Finland.
Email: moritz.albrecht@uef.fi

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Introduction

The bioeconomy and its aquatic subsidiary the blue bioeconomy are both strands of a wider green economic transition that currently plays a key role in government strategies and pathways towards a more sustainable society. Linked to the circularity of economic processes, both combine the promise of (regional) economic development with a sustainable, bio-based transition (EC, 2018, 2019a). The concept of land-based bioeconomy has been scrutinised through a variety of academic lenses, including its visions, sustainability aspects and locality studies (e.g. Albrecht, 2019; Bugge et al., 2016; Pfau et al., 2014). This academic attention is less present for blue bioeconomy developments despite the fact that 71% of the earth's surface is covered by water (Peters, 2010) and the pivotal role that aquatic resources are expected to play within a sustainable societal transition (EC, 2018, 2019b). In its role as a green transition policy and in comparison to land based resource exploitation, the blue bioeconomy is hailed for its capacity to relieve pressure on land use and create value without necessarily overexploiting resources by focusing on water areas, largely perceived as underutilised (e.g. EESC, 2019; MMM, 2016). In this vein, much of the blue bioeconomy is not only earmarked as "green" in itself, but there is a circular component of environmental improvement (e.g. rejuvenation, CO2 storage, reduced land-use pressure) attached to many of its current developments.

While the blue bioeconomy is defined as "... any economic activity associated with the use of renewable aquatic biological resources to make products ..." (EUMOFA, 2018), its current political and academic treatment (re-)produces it as a chimera taking forms through either blue growth, marine/coastal planning or watershed management paradigms that lack interconnectivity. In the EU, and elsewhere, the lack of concrete and institutionalised blue bioeconomy policies promote this divide while core aspects of blue bioeconomy policy are located in different and partially contrasting policy fields with a predominant focus on marine/coastal environments (e.g. EC, 2017). This situation is a derivative of the split responsibilities of various European Commission bodies (e.g. DG's R&I, MARE, ENVI, TRADE), their various focal areas, and from the different approaches of how countries interpret the blue bioeconomy. For instance, in the EU Finland is an exception because it actively includes inland waters in its current blue bioeconomy development (MMM, 2016), while even the current working group for an EU blue bioeconomy strategy pays only lip service to inland waters. Nevertheless, emerging political calls for a more inclusive blue bioeconomy have been raised (e.g. EC, 2019b; EESC, 2019), which places the blue bioeconomy in the initial phase of policy mobility processes and translation (e.g. McCann and Ward, 2012).

Aside from this divided and biased political employment, treatment of the blue bioeconomy and water-based governance research is further criticised as lacking an in-depth relational spatial focus that would allow its underlying processes and local materialisations to be displayed (e.g. Steinberg and Peters, 2015; Winder and LeHeron, 2017). The often normative sector or institutionally framed treatment of blue bioeconomy developments enables valuable assessments of blue policy visions, regional innovation networks, or water-based spatial planning (e.g. Silver et al., 2015; Voyer et al., 2018). The blue bioeconomy is more than the narrow definition above, it must be considered as part of a wider green/sustainable

transition process that spans beyond land-sea and aquatic-society dualisms (e.g. Anderson and Peters, 2016; Yates et al., 2017). There is consequently a need to scrutinise not only the core, but also the margins of its potential developments. Based on their predominant approaches, many current academic treatments seem ill suited to portray alternative blue bioeconomy developments not framed by a highly visible innovation component that propels them to the forefronts of policy or academic attention. Yet, despite their small public imprint, such developments are important pieces in the assembling of blue bioeconomy governance and its local materialisations. Furthermore, academic treatment of blue bioeconomy policies remains largely restricted to its particular field of policy (e.g. EU Water Framework Directive, Blue Growth Strategies) due to the lack of a uniting strategy similar to the EU circular economy package (EC, 2015). Consequently, more inclusive blue bioeconomy focused evaluations of national approaches and their role for particular local developments are currently missing.

Hence, this paper aims to contribute to two interlinked academic fields to forward an initial and deepened understanding of blue bioeconomy governance and address multiple water ontologies (Peters and Steinberg, 2019; Winder and LeHeron, 2017). First, it opens up the blue bioeconomy as an uncharted field of research to overcome the dualistic treatment criticised above and calls for more academic endeavours into this realm, including alternative developments. Second, it contributes to research on policy mobilities as assembling processes by scrutinizing both the initial moments when a policy is mobilized and subsequent loops of translation (Kortelainen and Albrecht, 2014). In this way it offers a conceptual and analytical frame suitable for researching blue economy initiatives within water related governance. As the paper is designed as a starting point, it does not aim to portray a detailed picture of blue bioeconomy governance but exemplifies the conceptual framings above through two particular cases in Europe and their local implementation processes: inland fisheries in North Savonia, Finland and seaweed farming in Møre and Romsdal county, Norway. The rationale for the case studies derives not from their inherit values as representative, comparable cases of blue bioeconomy developments but through their capacity to illustrate and connect diverse characteristics of blue bioeconomy policy framing and developments in a terrestrial, freshwater and marine coastal environment. Based on these cases, the paper evaluates two interlinked aspects of blue bioeconomy governance and their effects: 1) the role and characteristics of blue bioeconomy envisioned through national and regional strategies, and 2) the role of alternative developments within these green policy frameworks at the local/regional implementation level.

Based on qualitative research in the different national and regional contexts, and framed through policy mobility and translation assemblages (e.g. Baker and McGuirk, 2017; McCann and Ward, 2012), we use the cases to exemplify four key discursive-material "reconnections" (e.g. Braun and Whatmore, 2010) in the emergent stakeholder networks. These reconnections are linked to 1) valuations of resources; 2) technology and innovations; 3) local markets; and 4) emergent governance arrangements. Combined, the four elements offer a valuable perspective of the different translations and materialisations of the blue bioeconomy and counter the linear perspectives portrayed through most green/blue economy strategies and their regional potential analysis.

Case studies and methods

This paper focuses on two separate case studies of regional blue bioeconomy development at the margins of their respective political and economic fields. The case study in Finland examines the governance, value-chains and potentials of inland fisheries in the North

Savonia region. The main data was collected in a series of workshops with experts carried out in Kuopio, the regional capital, between August 2018 and March 2019. The Norwegian case study involves the development of small-scale seaweed farming in Møre and Romsdal county on the western coast, located in the island municipality of Herøy. Data collection for the Norwegian case was conducted during a 3-week research visit to Norway, including the case study locality in summer 2019.

The paper uses a multi-methods approach as its research data stems from two separate research projects following different data collection approaches and foci. While this constellation restricts the possibilities for structural comparison between the cases (e.g. Yin, 2009), the data from the two cases are employed as examples to illustrate multiple processes of alternative developments, their translation and assembling processes in different transnational and regional environments. Additionally, their focus on different water environments yet both linked to transnational debates on blue bioeconomy development provides their employment with the potential to bridge some of the divides in water governance raised above. Both case studies rest on a set of multiple data sources with a key focus on qualitative data collection and qualitative analysis through topical entitation (Cloke et al., 2006).

For Finland, the analysis builds on the regional knowledge co-creation process on blue bioeconomy carried out through a series of seven workshops. The workshops focused on scoping the challenges, opportunities and uncertainties of the current situation, setting feasible transition goals, building pathways to achieve change by utilising a tool specifically designed for the purpose and, finally, verifying the results in several commentary rounds. Overall, 14 specialists with a variety of backgrounds in business, administration, networks and NGOs participated in the workshops, which lasted approximately 26 hours excluding the commentary work between the meetings where 10 additional commentators were included. All the discussions were recorded, and the key insights were documented by notes, videos and photographs. Additionally, three scoping interviews were arranged prior to the workshops and an assessment seminar six months after completing the workshop series.

For Norway, the key data set rests on 13 in-depth, open-ended interviews with local seaweed entrepreneurs, political bodies, planners and experts at the municipal and county levels, Norwegian Fisheries Directorate, Norwegian Seaweed Farm Association, environmental NGOs (Trondheim and Brussels), Mission of Norway to the EU and a private Norwegian institute involved in seaweed research. Interviews were conducted in English and lasted between 50 minutes and 2.5 hours. A visit to the case study site included ethnographic components, such as visits to the farm site (by boat), processing facilities and a commented walk along the coast (Winkler, 2010), including wild algae harvesting and tasting with the owner of a local seaweed farm in order to achieve a detailed picture of local seaweed potentials and challenges. Additional data derives from a document analysis focused on blue bioeconomy and aquaculture related strategy papers, legal documents and position papers from industrial associations and NGOs in Norway and at the EU level. Finally, statistical data sets on local socio-economic parameters and aquaculture statistics in Norway complement the case study.

Approaching blue bioeconomies as assemblages

Current research on blue bioeconomy topics falls into three categories with little connection. First, the blue economy is addressed in a variety of fields, such as marine and coastal spatial planning, and fisheries, where the core foci include blue economy visions and aquaculture governance, "blue" technology solutions and ecological potentials and processes for future development (e.g. Voyer et al., 2018). Transformation focused geographical accounts

have treated matters of coastal community resilience (Kokorsch and Benediktsson, 2018), yet much literature is confined to the EU blue-growth agenda and its aspects of marine spatial planning (Lillebo et al., 2017). Similar academic focus prevails in the case study countries (e.g. Kvalvik and Robertson, 2017; Salmi, 2018). Second, freshwater governance literature focuses on river basin/watershed management and the EU water framework directive (WFD) (e.g. Boeuf and Fritsch, 2016). Additionally, integrated water resource management, adaptive water planning or a variation of nexus approaches linking water with a related entity, such as food or climate, evaluate water governance (Benson et al., 2015; Soininen and Platjouw, 2018). Attempts to integrate the politics of scale into water governance to overcome the technocratic treatment of waters by employing their co-constructed spaces have also been published (Norman et al., 2012). Third, land based bioeconomy research with a water focus is a comparably small field. It largely treats the effects of terrestrial bioeconomy developments on various water bodies (O'Brien et al., 2015) rather than regarding water bodies as potential blue bioeconomy development areas in themselves. Exceptions to this include closed system studies on CO2 and nutrient sequestration potentials of organisms such as microalgae for biofuel, chemicals, food or feed. Thus, the complexity of blue bioeconomy processes is reflected by this variety, yet the predominant economic centred and divisionary foci are at odds with a relational ontology to understand the spatialities of blue bioeconomy governance processes (Albrecht, 2019; Steinberg and Peters, 2015).

To overcome some of these restrictions this paper follows an assemblage approach (e.g. Anderson et al., 2012; Baker and McGuirk, 2017) framed through policy mobility and translation literature (McCann and Ward, 2012; Peck and Theodore, 2015) that allows the evaluation of the spatialities inherent to the implementation processes of blue bioeconomy governance (see also Albrecht, 2019). Subsequently, assemblage approach is primarily employed as a methodological-analytical framework (Baker and McGuirk, 2017) to access the reconnections of localized processes rather than to conceptualize the heterogeneous assembling processes of material and expressive elements, territorializations, codings or relations of exteriority (e.g. Woods, 2016). In human geography, assemblage approaches are employed largely to study relational configurations of terrestrial based processes such as urban development, policy mobility (McCann and Ward, 2012; McFarlane, 2011) or the assemblage of localities (Woods, 2016). Thus, it is well suited for a transnational policy field, such as the blue bioeconomy, wherein aspects of policy narratives, translations, mutation and localised implementations play a decisive role in its governance processes, outcomes and trajectories (Albrecht, 2019). The paper follows Peck and Theodore's (2015) suggestion to not merely follow the policy, in this case blue bioeconomy strategies through their institutional frameworks, but to assess the spatial processes at their resting places to understand their materialisation and implications for future development. Hence, in the cases at hand, national policy translations such as blue bioeconomy strategies are translated through the localised assemblages that are (re-)produced through locally embedded transnational relations and thereby not only shape the materialisation (e.g. Albrecht et al., 2017) of blue bioeconomy development but determine the outcomes of policy.

In order to grasp the elusive spatiality of a relational perspective (Massey, 2005), the paper supplements its methodological-analytical assemblage approach through the integration of blue entrepreneur positionalities and their localised material reconnections with the national policy sphere (Harvey, 1990). While the concept of positionality enables the evaluation of the spatial relations which guide the activities of entities within various assemblages (Albrecht, 2019; Sheppard, 2002), looking at processes through particular

reconnections allows us to portray some of the entities' key relations of positionality and therefore assembling processes.

The reconnection approach is a feasible analytical device while conceptualizing the policy assemblages from the perspective of localities. The attention to *reconnections* has been called for in research on alternative food networks and geographies of production and consumption (Crang, 1996; Morris and Kirwan, 2010). Morris and Kirwan (2010) frame reconnection as a practice of creating alternative knowledge and imaginaries on food based on environmental gains and rural development opportunities, thus enabling the de/refetishising of commodities in markets. Reconnections enable features of locality and origin to be attached to products in commodity markets, which can also imply aspects of quality and environmentally sound production methods (Thorsøe et al., 2018: 76), but may also carry elements of nostalgia and longing for past practices (see Kneafsey et al., 2008: 32). Therefore, it is important to note that reconnection is by no means "a coherent concept", although it helps to illuminate relational aspects in the mutating policy assemblages. According to Kneafsay et al. (2008: 32–34), it refers to diverse processes of discursively and materially connecting producers with markets, consumers with production processes, people with nature or, as in this paper, local development processes with policy narratives.

The value of the approach is methodological since it offers a means of conceptualising processes between different structural, material and discursive elements which take place under the umbrella of blue bioeconomy. It is valuable in acknowledging the active role of producer networks in forming alternative market spaces, but the conceptualisation of the 'practice of reconnection' also reveals the crucial role of technical development and local governance in enabling the emergence of 'alternative' blue bioeconomy assemblages. Moreover, the reconnections approach helps to partially bridge the dualisms in the blue bioeconomy, especially the freshwater/coastal binary, by highlighting commonalities in production dynamics and livelihoods. The reconnections are focal points in local actor configurations and valuable in articulating their perspectives towards national and transnational governance frameworks. In the following section we turn to the national case studies on blue bioeconomy governance in Finland and Norway.

Alternative blue bioeconomies

Case descriptions

The issue of 'underutilised fish stocks' came into focus through two interconnected collaborative governance interventions carried out in the North Savonia region in Eastern Finland from 2017–2019. The challenge is linked to increasing the catch of fish species that have traditionally been left untouched, while also linking to developing market demand and food production uses for these species. Furthermore, these challenges emphasise the need to reconsider the role of professional fisheries and local value chains in the region, which creates several reconnections and repositions entities in the local actor networks.

The seaweed farm in Herøy, Møre and Romsdal county was established in 2017 and has its roots in seaweed research projects at Møreforsking Institute. It is owned and managed by a former researcher together with local entrepreneurs involved in the local fisheries/seafood sector. The farm has two licenses covering an area of 43 hectares, of which only two hectares are currently utilised in active production based on an initial pilot scale production strategy. While we do not treat this farm as a representation of seaweed farms in Norway, it portrays the localised positionalities that (re-)produces the development processes in relation to the

material reconnections raised above that many of the current seaweed farmers are subjected to in Norway very well.

The role of national strategy

Both national bioeconomy strategies here, as most others around the world (Bioökonomierat, 2015), are framed through a policy conceptualisation that aims to green economic conduct through a focus on circular and more efficient biomass resource utilisation, reduce climate impacts and our dependence on fossil fuel resources, and increase value creation and employment (Norwegian Ministries, 2016; TEM, 2014). However, they differ greatly based on their national translations of transnational policy ideas and therefore create very different environments for blue bioeconomy development processes (e.g. Albrecht et al., 2017).

In European and global comparison, Finland is seen as an exception because it stresses natural resource utilisation rather than knowledge production (Bosman and Rotmans, 2016). The national bioeconomy strategy for Finland was published in 2014 and its main emphasis is on improving the efficiency of natural resource utilisation, especially in the forest industry and related sectors (TEM, 2014). The blue bioeconomy is not mentioned as a concept because the focus is extensively in 'green' resources, especially those resources for the forest industry. However, water receives several mentions throughout the strategy as an underutilised resource-base by providing biomass, ecosystem services and clean water as an environment to be protected through purification technologies and process innovations. Both frames are well aligned with the general approach of resource based bioeconomy and can be considered as a starting point for more systematic work on constructing the national development plan for a blue bioeconomy that was introduced in late 2016 (MMM, 2016) and was followed up by the national research and development agenda "*Out of the Blue*" (MMM, 2018). The plan provides a substantially different framing of bioeconomy by suggesting services and knowledge production as the main development areas of the blue bioeconomy in addition to an improved resource base. The plan also lays out the metrics and goals of how the different areas of the blue bioeconomy are contributing to the economy.

The plan anticipates substantial economic growth in all sectors over a ten-year timespan by proposing actions in four distinct areas (public-private collaboration, servitisation, education, and internationalisation) connected to the knowledge-based bioeconomy agenda. The underlying vision of the plan is to tap into sustainable utilisation of blue resources in different forms, while also turning the currently fragmented knowledge base into an exportable commodity to tackle global water-related challenges. Regarding fisheries, the blue bioeconomy strategy builds on and legitimises goals set in the national aquaculture strategy 2022 (Council of State 2.12.2014) and the national location allocation plan for aquaculture (MMM and YM, 2014), which have created anticipation for growth in blue resource utilisation. Each of the national strategies are grounded in the sustainability challenges facing global food production systems and the less-than-good ecological status of the Baltic Sea. However, the strategies also paint a very straightforward picture of development, based almost uniformly on increasing coastal fish aquaculture.

The national blue bioeconomy policy trajectory thus carries potentially unaddressed challenges. *First*, the agenda confounds the blue bioeconomy with more general blue growth strategies. Much of the added value is expected from technological development and process innovations related to such issues as water purification, closed-circuit production chains and industrial symbiosis that indirectly contribute to the state of the

environment and blue resources. Thus, the development in resource utilisation and services can be interpreted as secondary to knowledge-based business. *Second*, the role of policy in the governance of natural resources remains weakly addressed in the strategy. Public policy is framed as a passive facilitator and provider of financial basis or as a silo where critical expertise is currently locked up and which needs to be opened up for more dynamic utilisation. However, it is evident that policies have a much more prominent role in creating market conditions for new products and addressing the state of the environment and could thus merit a more balanced positioning.

In Norway the blue bioeconomy operates within a very different policy and economic realm. While not bound to the EU bioeconomy strategy and its policy framework, Norway's bioeconomy approach nonetheless links to the initiation of transnational bioeconomy policy strategies at the OECD and EU levels. The Norwegian bioeconomy strategy's focus, while framed through a knowledge-based approach, includes a strong resource use perspective, which additionally highlights food production, resource efficiency and the aim to develop the most profitable resource use as overarching principles (Norwegian Ministries, 2016). Its knowledge-based context particularly derives from its orientation towards currently underutilised areas of biomass and its cross-sectoral approach to resource efficiency and innovation, for example the utilisation of side streams from fisheries or forestry. Additionally, the Norwegian strategy sets rather strong emphases on market creation and the reduction of market uncertainty for new bio-based products to facilitate innovative developments.

Despite being a core focus in Norway's bioeconomy strategy due to its current underutilisation, the forest based bioeconomy, which plays the lead role in other northern European countries, is clearly second to blue, ocean and coastal based economic developments in Norway's policy focus; though it appears ahead of agriculture (Norwegian Ministries, 2016). Similarly, expectations of Norwegian bioeconomy development are highest within the aquaculture sector (Hansen and Bjørkhaug, 2017). While the term "blue" in relation to economic sectors and supply chains is utilised, the concept of blue bioeconomy does not appear in either the Norwegian Bioeconomy or the ocean strategies (MTIF and MPE, 2017). Nonetheless, blue bioeconomy sectors are attributed a key role in both with a focus on marine/coastal aquaculture and fisheries, including its technologically focused affiliated industries and research. New knowledge and technology are regarded as paramount to tap into the promising potentials from the mesopelagic zone (between 200 – 1000 m deep) for fisheries, as well as to overcome current challenges and exploit potentials in aquaculture development.

Thus, while potentials in the fisheries sector require a vertical leap into the mesopelagic zone, blue bioeconomy development on and near the surface is envisioned largely through aquaculture. Increased resource exploitation, thus blue growth, remains a core aspect in policy aims by focusing on sustainable extraction (e.g. MCE, 2017). Aquaculture increase is separated into two fields within the Norwegian bioeconomy Strategy; 1) fish based aquaculture with a focus on salmon farming and attempts to tackle current challenges regarding their environmental impacts, such as nutrition and phosphorous off flow, sea lice, disease, and escapes; and 2) aquaculture related to alternative species with a focus on macroalgae (Norwegian Ministries, 2016). Theoretical growth potentials for macroalgae (seaweed) have been calculated as high as 4 M tonnes by 2030 (Olafsen et al., 2012) and up to 20 M tonnes by 2050 (Skjermo et al., 2014) with current production being 180 tonnes in 2018 (Fiskeridirektoratet, 2019). In relation to macroalgea cultivation, the Norwegian bioeconomy strategy and related policy documents generally portray a bright future. Their potentials are not merely portrayed as a resource to develop value added products, such as

biofuels, base chemicals or food and feed applications, but also as environmental remediation tools to solve other challenges in blue bioeconomy development. Particularly their theoretical capacities to recycle nutrients and phosphorus from salmon farms through *integrated multi-trophic aquaculture* (IMTA), aquaculture consisting of a combination of fish and other species (e.g. seaweed, muscles) in close proximity is highlighted.

Parallel to required technological advancements that are supported by a variety of research and development programmes and funds, two aspects of Norwegian bioeconomy policy are considered decisive to enable future aquaculture growth. First, to facilitate and streamline spatial planning and licensing processes to guarantee increased availability of farming sites and avoid water use conflicts; and, second, to increase public knowledge on novel products and support market creation (Norwegian Ministries, 2016). Both directly support the blue growth logic that underpins not only the bioeconomy strategy but also other blue economy related frameworks, like the Norwegian ocean and aquaculture strategies (MFC, 2009; MTIF and MPE, 2017).

Consequently, compared to the Finnish strategies, the Norwegian policy framework seems well suited to support alternative and novel blue bioeconomy developments, particularly related to seaweed farming due to its emphasised role in the main policy documents. However, seaweed farming realities along Norway's coast reveal that it is a marginal economic sector with 23 companies operating 172 licenses and 178 tonnes of production (Fiskeridirektoratet, 2019) in comparison to an annual wild seaweed harvest of approximately 150 000 tonnes (Havforskningsinstitutet, 2017), and more than 1.35 M tonnes of fish from aquaculture production (Fiskeridirektoratet, 2019). Hence, seaweed farming is in its infancy, which brings along a series of technological and socio-economic challenges and requires an alternative reading of regional blue bioeconomy development. The same holds true for Finland, where the national strategies emphasise economic growth achieved by increasing coastal fish aquaculture and focused research activities. For example, the National Fish Aquaculture Strategy 2022 aims at doubling the amount of annually farmed fish in coastal areas (MMM, 2014). In practice, fish production might even decline as the EU WFD prevents ecological permits for additional economic activities in areas with a less-than-good status. The blue bioeconomy policies mention the potentials linked to "underutilised fish stocks" (species of fish that are not the focus of commercial fisheries, but which could be harvested without compromising the status of lake environments) with little consideration. The annual catch of the underutilised fish stocks counts for about 4500 tonnes compared to the commercial catch of 150 000 tonnes and fish aquaculture production of 145 000 tonnes (Luke, 2019).

Hence, when looking at national translations of blue bioeconomy related policies a diverse picture evolves portraying different approaches and potentials for future development. Next we turn to the positionalities and assembling processes related to local materialisations, their reconnections with, and translations of blue bioeconomy policy. This move beyond assumptive policy narratives (Albrecht, 2019) consequently allows us to access the relations that are (re)produced for seaweed farmers and lake fisheries to understand the wider assembling processes that guide blue bioeconomy development and the effects on policy mobility.

Discussion: Alternatives and reconnections of (regional) blue bioeconomy

While the national translations of blue bioeconomy policy aspects portray a smooth picture of governing spaces (e.g. Wood, 2016), the regional materialisations and associated practices

of specific developments are entangled through their own positionalities within blue bioeconomy assemblages (Albrecht, 2019). The following section discusses these processes through four key reconnections that link and visualise local processes with various contested realms of blue bioeconomy development.

Reconnecting blue resource values

In Finland commercial inland fisheries have dominantly focused their catch on one fish species, vendace (*Coregonus albula*), which is a small plankton eating fish. The vendace catch of approximately 5000 tonnes has been relatively stable and represents 50% of the annual inland fish catch (Luke, 2019). In national blue bioeconomy policies the inland fisheries are not given much consideration, but the shallow lakes are seen as vulnerable to eutrophication, which is also a key measure in the EU WFD and river-basin management regimes. However, the fisheries have pointed out that increasing the catch of selected species and targeting specific areas could potentially contribute significantly to the removal of nutrients from lakes, reduce eutrophication and help rejuvenate bodies of water. Currently, lake rehabilitation activities are exclusively managed and carried out by environmental authorities, but a link with commercial fisheries seems promising – especially if the value of fisheries is considered beyond the economic value of the catch. This connects to much traditional local thinking, where fisheries are framed as 'the guardians of lakes', emphasising the role of nurturing fish stocks and the ecological status of lakes to sustain its reproductive capacities. The support for and acknowledgement of the alternative roles of fisheries could create continuation in the sector, but also support better utilisation of the catch as currently less than 9% of the annual catch is employed in food processing even though the market demand for alternative fish sources has grown steadily (see biotalous.fi 2019).

In Norway, this reconnection appears via the initial and policy based valuation of seaweed farming through envisioned potentials on bio-refined, high added-value products to generate profit margins, such as chemicals, cosmetics or functional food and animal feed. Yet, the weak cost competitiveness of small-scale, farmed Norwegian seaweed compared to wild harvested seaweed from Europe or farmed seaweed from Asia make it very challenging to enter the field if the aim includes the economic feasibility of the farm (see also Chapman et al., 2015). Hence, for farms not largely financed through research funding or co-owned by large corporations (e.g. Ocean Forest) farming for predominantly local human consumption has become the key valorisation to generate turnover. In the case of Herøy farm, the result is that much of the value chain from farming to processing and final product distribution is integrated in their work despite limited resources. It also opens up challenging relations to sectors such as food retailing and market regulations and their complex legislative frameworks for these farmers. Not surprisingly, the current profitability or sustained economic feasibility of most farms is challenging and was even widely questioned throughout the interviews. Additionally, this development significantly decouples local development from the policy narratives of key political documents. Another related aspect of this first reconnection of seaweed farming is its valuation as an environmental remediation tool for fish based aquaculture. While it plays no direct role in the Herøy case, it affects the wider policy assemblage development and policy translation in which the farm operates, as will become more visible in the second reconnection.

Reconnecting technology and innovations

In the context of North Savonia, vendace fishing is usually carried out by trawling and winter-seining techniques that are optimised to match the seasonal schooling patterns of the fish. The "underutilised" fish stocks refer mostly to predatory species, such as perch, roach, pike and pike-perch, that are caught in smaller quantities and in some cases as a bycatch of vendace. This poses a potential challenge for the fisheries as the handling and sorting of the catch needs to be re-organised to match the demands of the value-chain. This also creates space for the new social and technological innovations that take time to develop. First, some fisheries have already moved to digital 'tagging' of their catches to keep track of the available fish resource through the whole refinement chain and form larger batches. Second, investments in collective infrastructures, such as freezing units, have enabled the storing and combining of smaller catches over time and reduce the seasonality of the activity. Third, innovations related to trawling have reduced the harm to endangered fish species in the lakes and thus enabled a more focused catch. Finally, reconsideration of the fisheries practices as self-sufficient entities has led to collaboration between the geographically proximate fisheries to combine catches, share economic risks and invest in modern equipment. The innovations are not expensive, but they demand new ways of understanding the fisheries in relation to technologies and collaboration.

In Norway this reconnection is related to the technology/innovation systems of seaweed farms. The handling of biological processes through technical solutions are key to successful farming, such as seeding or harvesting systems as well as post harvesting treatment. Due to the complex biological processes, even small errors in these fields have the potential to destroy any useful product. Generally, the current technical requirements of harvesting and processing were described as rather low-tech, carried out with small vessels and often in do-it-yourself prototype processing facilities (e.g. drying chambers) due to the small amounts, limited financial resources and trial and error approach based on a lack of knowledge with the biological processes during farming. On the contrary, it was pointed out that the local innovation capital based on the marine sector's expertise to provide and generate low cost, partially self-made solutions to fix problems in farming (e.g. rig constructions, rope connectors, etc.) is extremely high and important for the farms to draw upon. Another technical aspect related to seaweed materialities, particularly its rapid biological decay above surface, are solutions that enable swift processing (e.g. drying) after harvesting. While there are multi-million euro research grants to design industrial scale harvesting vessels or projects with chemical producers for large scale processing, these solutions circumvent small-scale farmers. In Herøy, this challenge is mainly solved by proximity between the farm and landing/processing site, which are approximately 500 m from each other. Finally, seaweed farming is presented as an innovative practice to solve environmental challenges of fish-based aquaculture. While this is a complex issue in terms of nutrition uptake and circularity of phosphorous flows that go beyond the scope of this paper, compared to most policy narratives of IMTA based seaweed farming, a farm manager involved in large-scale development simply pointed out that, *"we saw that it's impossible to have seaweed farm next to a fish farm"* (Interviewee I) due to a variety aspects ranging from boat traffic to disease control. Yet these innovation focused policy narratives continue to play a key role in public and political accounts of seaweed farming potentials in Norway and elsewhere. Similar doubts were raised in relation to the technical and economic feasibility of offshore farming deemed as necessary for the foreseen growth potentials and related industrial scale valuations of seaweed farming (e.g. Broch et al., 2016).

Reconnecting blue markets and products

In Finland the share and value of imported fish has been steadily growing to the annual level of 350 M euros. In the case of underutilised fish, the development of local markets poses a chicken-and-egg dilemma: most fisheries postpone investments in novel technologies because the existing market-demand is non-existent and the processing industry and institutional kitchens remain uninterested because the individual fisheries cannot provide enough fish to meet large-scale demands. However, there is potential in North Savonia, as the new products developed from the fish biomass processed from the lake catch have gained popularity in other regions. Different actors share a sentiment that the public sector, especially industrial kitchens, should act as an intermediary that could coordinate and bundle together the dispersed catches from several fisheries to meet larger demands, cover seasonal variations and enable investments in the food processing industry. However, the rules for public procurement are currently strictly tied to the price signals and, for example, Atlantic pollock can be purchased at half the price of local roach. Some "rebel-municipalities", like Kiuruvesi at the northern edge of the region, have demonstrated alternative procurement practices in collaboration with local fisheries but they have faced jurisdictional consequences. Therefore, a more active public sector role in market creation would benefit from policy translations that integrate such localised positionalities and allow for changes in the governance approach. However, the active and enabling role of the public sector in the transition phase is not unique to the blue bioeconomy.

Norwegian food culture and market creation for seaweed products portray a similar chicken-and-egg problem. While seaweed in sushi restaurants is familiar to Norwegians, the use of local seaweed for human consumption is not part of Norwegian food culture, thus it requires market creation from scratch. Looking at Norwegian consumer markets, it was stated that, *"... the most sceptical customers, they're here by the coast of Norway..."* (Interviewee II). Contrary to the fish aquaculture industry with its lobby groups, like Seafood Norway, the task of market creation for seaweed as food remains largely with the farms themselves despite being a core aim of the Norwegian bioeconomy strategy (Norwegian Ministries, 2016). [Hence, Norwegian Seaweed association members bundle their efforts with joint activities, for instance a stall at the 2019 food festival in Bergen. For the Herøy farm, potential markets are broadly separated into a local and the national/foreign market. While locally the regional character of the product is key, the transnational, largely urban markets are in the organic and sustainable health food segment. For this reason, all products are certified organic and customers in Oslo were described as being similar to German customers rather than to Norwegians in the rural coastal areas. This need for market creation pushes local farmers to develop their own "spear head products" to increase customer interest for the actual product, dried seaweed. In the Herøy case, algae covered nuts have been designed for this purpose. While these snacks have opened up local and (inter)national markets and created positive feedback for the company, it kind of reduced the locality of the product resources due to the low seaweed content. Compounding these market issues, food regulations, such as ingredient labelling and official nutrition tables, play a crucial role in market access and heavily affect the positionalities of entrepreneurs and localised blue bioeconomy assemblages. Additionally, as with market creation, there is a mismatch between the supportive measures portrayed in national policy translations and their availability to stakeholders involved in alternative, small-scale developments to tackle these complex issues.

Reconnecting water governance arrangements

In Finland lakes are managed as a common resource that are maintained by administrative water co-operatives. The membership of co-operatives is based on property ownership along the waterbodies. However, the geographical boundaries of the co-operatives are often arbitrary and a result of historical path dependencies, which make them difficult to identify on the water. There are 23 water co-ops in the North Savonian region alone, and their memberships consist extensively of elderly people. The co-ops have been successful in maintaining a shared understanding of the water and sharing of leisure rights for fishing and water use. However, they pose a specific challenge for the development of commercial fishing as the fisheries need to reach official agreement with each of the co-ops in their operational area. In an extreme case this means that a commercial fisher must form and maintain personal relations with each landowner in his/her fishing area, which is an enormous effort and displays the heterogeneous realms that affect localised assembling processes in blue bioeconomy governance. In addition, commercial fishing carries the stigma of over-fishing based on some historical experiences, which makes the dialogue problematic in several cases. The developer network *Eastern Finland Fishery Group* has been especially active in arranging tailored counselling for the co-ops as well as organising mergers of the most dysfunctional units. However, development has been modest and stakeholders in the fisheries sector call for increased governance intervention.

In Norway the fourth reconnection is exemplified by the shifting requirements of spatial planning and licensing schemes for seaweed aquaculture. Aquaculture legislation and planning processes in Norway are designed for fish. While licensing schemes are slowly revised, it was pointed out that currently *"everything is framed around fish, particularly salmon* [and that] *licensing and concession applications make no sense . . ."* (Interviewee III). To improve the situation for interested parties, Herøy Municipality along with the seaweed farm in Herøy, Norwegian Institute for Water Research, and Runde Environmental Centre conducted a project called "KOM TIL TARE" (*Communal Guidelines for Coastal Seaweed Farming*) that created a step by step guide to understand and move through the seaweed farming application processes (Herøy kommune, 2017). Yet, the changing legislative framework has made parts of the tool obsolete and there is no follow up focusing directly on seaweed. Still, seaweed farming is in the same spatial planning context than the highly criticised and negatively perceived salmon farming despite its different spatial requirements (e.g. depth, water flow) and despite its zero input character contrary to the high input based (feed, medical/chemical treatment) fish aquaculture. In the case of Herøy, the farm can draw on high quality GIS seabed maps and the municipality planning office is experienced with seaweed issues due to past projects. However, a local planning expert pointed out that this was not the norm in many Norwegian coastal communities. Current expectations on coastal planning for the planning period of 2019–2023 highlight an inter-municipal approach to improve the situation (MLGM, 2019), but it remains to be seen if this solves or creates additional challenges related to the complex positionalities of those involved.

The four reconnections overlap in several aspects and, as previously stated, do not represent an inclusive picture but display some key assembling processes that bind or decouple the challenging blue bioeconomy positionalities of the entities that implement local, alternative developments to the (trans)national assemblages of mobile policies and their translation. There are several social and technical innovations taking place that are not necessarily measured in added millions of export revenues, but rather in enhanced local resilience, environmental condition, culture and self-sufficiency. But the reconnections also show clear mismatches between nationally framed policy narratives (Wood, 2016) and the

policy tools that aim to support inclusive blue bioeconomy development and local implementation realities (see also Albrecht, 2019). Thus, the "practical work of reconnecting" reaches beyond creating links between geographies of production and consumption and involves relational assembling processes that span a multitude of socio-economic realms and move beyond the sea/land and marine/freshwater dualisms present in current water governance (Steinberg and Peters, 2015; Winder and LeHeron, 2017). Hence, they not only connect spatially variegated challenges in the places of policy translation for a more diverse understanding of policy mobility processes (e.g. Peck and Theodore, 2015) but also display how multiple ontologies in water governance (e.g. Peters and Steinberg, 2019) are an integrative part of local and transnational blue bioeconomy assembling processes. The final section concludes with some key messages on the effects between the interlinkages of policy strategies and their often assumptive narratives and local alternative implementation positionalities for the blue bioeconomy in Europe. It also raises some needs for future research.

Conclusion

This article has displayed two exemplifying, alternative local blue bioeconomy developments and their positionalities in relation to the heterogeneous spatial assembling processes of national blue bioeconomy policy translation and locally grounded implementations. Rather than providing a detailed account of the particular assembling processes that guide policy translation and implementation in the separate case studies, this study has focused on four key reconnections that highlight some challenges and mismatches, but also potentials that may arise between national blue bioeconomy policy assemblages and their localised assemblages of implementation. While the reconnections are applicable in both freshwater and marine environments, the focus on positionalities has enabled a valuable linkage between terrestrial and aquatic spatial processes. We consider the reconnections approach framed in a wider conceptualisation of policy mobility and translation as an overarching methodological tool to see what is aligned in the (trans)national assembling of blue bioeconomy governance and what is not. It can open perspectives to articulate and mobilise local requirements for alternative approaches, but also reveal gaps between strategies and localised processes of implementation.

The reconnection approach also displays a variety of relations between national and international blue growth/bioeconomy strategies and the local geographies they are connected to through the processes of implementation. In Finland the knowledge-intensive framing of the blue bioeconomy could benefit from understanding knowledge production from the perspective of embeddedness to local practices and networks, which were exemplified in the case of underutilised fish stocks. In Norway, the extreme growth expectations of industrialised seaweed farming are misaligned in terms of current socio-technological realities and a more nuanced understanding of the ecological, technological and social aspects of the emerging sector could provide a better basis for future development and provide sustained room for small-scale developments. Similarly, a de-coupling from fish based aquaculture in various aspects would reduce mismatches and allow for policy translations in line with the local positionalities of seaweed farmers. Hence, the displayed reconnections are not intended to create normative counter-discourses for the hegemonic blue-growth policies, but as a locally and socially embedded way of re-reading challenging processes that (re-)produce bioeconomic governance assemblages that are currently missing from key policy narratives, and which therefore limit the potentials of alternative developments. Finally, the framework further points to the potentials to engage with localized blue (bio)economy developments through a more profound assemblage conceptualization

(e.g. Woods, 2016). While this has been beyond the scope of this paper, it would allow a more detailed, relational picture of blue (bio)economy localities, contested trajectories and their continuous and heterogeneous unfolding to be evaluated in future research.

Returning to the study at hand, several practical recommendations can be drawn from the analysis. First, the reconnection and assemblage approaches question the purpose and need for singular strategies that target wider economic audiences and point towards the potentials of more inclusive, adaptive and knowledge-based approaches in mobile policies. The problem is in the societal lock-ins around goals that only benefit specific actors and their inability to adjust to alternative interpretations that might be more beneficial in different regional implementation contexts and follow different values as assessment criteria. On the contrary, it highlights a set of spatial processes inherent to both inland and marine blue bioeconomy governance and thereby promotes an academic treatment of blue bioeconomy governance that avoids the current gaps between these realms. Second, the claim of combining economic growth and environmental sustainability at the core of bioeconomy discourses might benefit from a recalibration. Both cases present encouraging approaches to bridge this gap, but they are the results of rather small-scale activities that are not readily scaled-up, at least not without calling into question the sustainable and local character of these developments. Nevertheless, they are examples of how stronger local/regional networks with value drawn from places other than increased resource exploitation could be formed. Third, the regional reconnections reveal an active and enabling role of public policy as a certain necessity. In the case studies at hand, this is particularly true concerning market creation and access for locally sourced products. The public policy role – weak in the Finnish strategy and unsuitable to the needs of local seaweed farmers needs in Norway – could take an active role in orchestrating the actors in the field and intermediating across the scales of blue bioeconomy governance. Fourth, acknowledging the role of regional assembling processes based on stakeholder positionalities enables blue bioeconomy understanding and development that matches local spatialities. For example, elements such as food cultures, non-standardised product-chains, and low-tech innovations that do not align with nationally shaped growth- and innovation-oriented policy translations must be taken more seriously, particularly in academic studies in order to grasp the multiple ontologies of water in governance processes. While these have potential also in terms of employment and economic gains, they are not that easy to quantify and commodify through fixed indicator sets as practiced in most policy narratives. However, they generate an array of alternative values for local and transnational (blue) bioeconomic development that require continuous scrutiny in research and policy integration.

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ORCID iD

Moritz Albrecht https://orcid.org/0000-0002-5784-7793

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Moritz Albrecht is assistant professor in Environmental-Political Human Geography and is specialized in sustainability and natural resource governance in Europe. His core research focus is on spatial conceptualizations of bioeconomy governance, covering aspects from EU policy making, national policy translations and case studies of local implementation. He has conducted studies in Finland, Norway, Germany, France, Russia and Estonia. His current focus is on (blue) bioeconomy governance and place making. He coordinates a consortium cross-border cooperation project on waste management in rural communities in Russia and Finland.

Jani Lukkarinen is a geographer focusing on societal sustainability transitions and transformations in different spatial and topical contexts. His research interests include renewable energy policy, water governance and forestry. Recently, he has organised regional knowledge co-creation processes on socio-technical transitions related to blue bioeconomy.