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Abstract

Bioeconomy is an emerging concept that is gaining momentum both in science and policy. More specifically, forests are recognised as a significant contributor to any development of a bioeconomy as a source of renewable biomass. Sweden is a country that is well positioned to transition to a bioeconomy as it is both dominated by forests and has already embraced renewable energy as an increasing alternative to fossil-based energy. Sweden also has a tradition of forest policy that has historically emphasised production. The aim of this study is to investigate the forest sector's perceptions of the bioeconomy concept and see whether the concept is bringing the diverse range of forest actors together as a bridging concept or alternatively is being used to either promote individual agendas as a boundary object or even cause a divide within the forest sector.

To measure these perceptions, twelve forest sector representatives were interviewed, including ENGOs, forest industry and forest owners. The results of this study show that the bioeconomy concept is broadly accepted, supporting the notion that bioeconomy is a natural extension of the Swedish forestry model. The results also showed that there is great potential for bioeconomy to act as a bridging concept within the Swedish forest sector. However, this hypothesis did not have unanimous support, as some actors did not recognise any need to change their behaviour, instead using the concept simply to promote their own opinions. Despite this difference, there was a general agreement that bioeconomy represented a positive development for society, with a transition from fossil fuels to biomass being a way forward towards a greener future.

Keywords: Bioeconomy, forest sector, Sweden, bridging concept, framing analysis, perspectives

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1 Introduction

Bioeconomy is an emerging concept that is gaining momentum both in science and policy (Goven and Pavone 2005; Pülzl et al. 2014; Staffas et al. 2013). Although it's meaning is still in flux, bioeconomy is a term increasingly used by the European Union and consequently, has a significant potential to influence forest policy in Sweden (Pülzl et al. 2014). Sweden has already taken the first steps towards transitioning to a bioeconomy having both acknowledged the concept and outlined the knowledge gaps needed to progress the concept in policy (Formas 2012). Sweden is also a country well positioned to develop an economy based on biomass being dominated by forests and a leading contributor to the global forest market. These factors make Sweden an ideal country to study bioeconomy, specifically how the concept is perceived and used by the main policy actors in Sweden's forest sector.

1.1 Bioeconomy

Bioeconomy has become increasingly popular in the last decade with an increasing number of publications that use and articulate the concept (Staffas et al. 2013). This increase can, at least partly, be attributed to the publication of the Organisation for Economic Cooperation and Development (OECD) document *The Bioeconomy to 2030: Designing a Policy Agenda*, which states that bioeconomy *"offers technological solutions for many challenges facing the world […] but achieving its potential will require appropriate national, regional, and in some cases, global policies"* (OECD 2009: 19). Progressive reference to bioeconomy, both in politics and literature, suggests that it has the potential to become a *"new influential global meta-discourse"* and consequently influence the conceptions of forests, forestry and forest policy (Pülzl et al. 2014: 386).

There are a range of definitions and terms used to describe bioeconomy, with some placing more emphasis on the use of biotechnology, however bioeconomy can essentially be defined as an *"economy based on biomass for food, feed, energy and other purposes, rather than fossil-based resources"* (Staffas et al. 2013: 2765). Kitchen and Marsden (2011) describe the idea of bioeconomy as having emerged out of an increasing concern about resource depletion and climate change. Bioeconomy encompasses the full range of natural and renewable biological resources, both as a product itself or used as raw material (Scarlat et al. 2015; Socaciu 2014). In this regard, bioeconomy is not a new concept as economies prior to the industrial revolution were mainly based on the extraction and use of renewable natural resources (Scarlat et al. 2015). Schmidt et al. (2012) provides an overview of definitions and political concepts of bioeconomy used in the last decade.

Bioeconomy has a key role, as part of a wider green economy, as it represents a transition from an economy based on fossil fuels to a more resource-efficient economy based on renewable raw materials (Scarlat et al. 2015; Socaciu 2014). The concept of the *green economy* has emerged in recent years as a strategic priority for governments and intergovernmental organisations, specifically in Europe where it features prominently in a range of EU programmes and strategies, including the Europe 2020 Strategy (EEA 2014). Building a bioeconomy is recognised as an opportunity to address global challenges such as a growing demand for sustainable supply of food, raw materials and energy, climate change and energy security (OECD 2009; Scarlat et al. 2015). The development of a bioeconomy will consequently provide opportunities for both traditional sectors, such as agriculture, fishery and forestry, and new bio-based sectors (Scarlat et al. 2015).

1.2 Forests in a bioeconomy

Forests and the forest sector are expected to provide a significant contribution to a bioeconomy (EC 2012). As a significant producer of the world's biomass, forests are totally decisive for a transition to a bioeconomy (Scarlat et al. 2015; Sveaskog 2014). In Europe, the forest sector has an estimated share of more than 30% of the European bioeconomy, which has an annual turnover of EUR 2 trillion, making it a significant contributor to the European economy (Hetemäki 2014). However the European forest sector is expected to undergo significant structural changes – with markets for some traditional products in decline and increased competition from emerging economies – as it transitions towards a bioeconomy. These two factors stress the importance of developing a better understanding of the forests role in a bioeconomy.

Forests have an advantage over other sources of biomass in that they have a large production potential that can be used without threatening food security (Ollikainen 2014). As the bioeconomy concept has developed to include a great variety of agendas and ambitions, it implies both challenges and opportunities for the forest sector (Kleinschmit et al. 2014). Converting from the use of fossil fuels to renewable resources would increase competition for raw materials as well as challenges arising from increased use of a natural resource. Increasing demand for wood potentially increases environmental pressure on forests. The forest sector already contributes to a bioeconomy with timber and pulp, however a challenge for the sector will be to find new value-added products, necessary to remain at the forefront of a bioeconomy (Ollikainen 2014). In addition to these challenges, a bioeconomy also provides new opportunities for the forest sector to complement traditional products with new products and services to maintain and improve competitiveness. Bioeconomy is especially relevant for Scandinavian countries, where the forest sector already contributes up to 5% of the gross value of their economies, two to four time mores than the European average (Hoen and Hetemäki 2014).

1.3 Bioeconomy in Sweden

Sweden has already taken the first steps towards developing a national bioeconomy with Formas (2012) developing a national research strategy that identifies the research needed to provide knowledge necessary to support a transition. Sweden has yet to develop a national policy that addresses bioeconomy but it has developed its own definition, describing it as:

> *[…] a transition from an economy that to a large extent is based on fossil-derived raw materials to a more resource-efficient economy based on renewable raw materials produced by the sustainable use of ecosystem services from land and water. This means trans- forming biomass materials into different types of products, such as food, energy and industrial products (household products, composite materials, pharmaceuticals, paper, textiles etc.). (Formas 2012: 16)*

Sweden is well positioned for being able to convert to a bioeconomy (Formas 2012). Sweden is a country dominated by boreal forests and as such, has a large resource of raw material to enable a transition from a fossil society to a renewable society (Sveaskog 2014; The Royal Swedish Academy of Agriculture and Forestry 2015). Traditionally, production and refining of the forest biomass has contributed significantly to Sweden's economy with the Swedish forest industry being the world's second largest combined exporter of pulp, paper and wood products and also a leading country in the use of forest fuels and associated technology (Formas 2012; The Royal Swedish Academy of Agriculture and Forestry 2015). For example, raw tall diesel (RTS) is a biodiesel developed in Sweden that is produced from pine oil, a waste product from pulp, and currently contributes up to 2% of diesel used in Sweden (Sunpine 2016). With the reorientation of the Swedish energy system towards renewable energy, following the oil crisis in the 1970s, bioenergy – mainly based on forest biomass – has also become increasingly important in Sweden (Björheden 2006). Sweden is also a

leading nation in forestry and forest industry research with Swedish companies *"right in the forefront of the development of wood and cellulose-based products such as bioplastics, biocomposites and textile fibres"* (Swedish Forest Industries Federation 2012: 11).

Sweden can also be considered a leader when it comes to green policy as it has had very ambitious legislation for environmental protection for the past 30 years (McCormick et al. 2015). National initiatives that focus on increasing the share of energy generated from renewable sources, being a country without net greenhouse gas emissions and being a world leader in recycling cans and bottles illustrate Sweden as a country with progressive environmental policies.

1.4 Current research

As already described, the bioeconomy concept has become increasingly popular in politics but also as a research topic. Recent contributions have progressed knowledge of the concept, with various aspects studied including its definition, its context in relation to global trends and the expanding role of forests in a cross-sectoral political framework.

There has been a significant amount of debate around the definition, with both Schmidt et al. (2012) and Staffas et al. (2013) reviewing both the historical development and differences in definitions. Pülzl et al. (2014: 391) analysed bioeconomy in the context of previous forest related discourses, concluding it can be seen as a *"mixed-source discourse"* as it combines elements of other meta-discourses such as sustainable development and ecological modernisation. Kleinschmit et al. (2014) recognised the importance of developing a holistic knowledge base aimed for the development of a bioeconomy and responded by identifying a range of potential contributions from a variety of disciplinary perspectives. Goven and Pavone (2015: 21) provide a more Marxist perspective and describe bioeconomy as "*fictitious commodification"* designed to extend and defend a *"neoliberal-capitalist regime"*. Although they are critical of the bioeconomy concept, they highlight the fact that bioeconomy is very much a political concept as it is a scientific and economic.

Although there has been a substantial amount of research on the concept of bioeconomy, there is very little, if any, literature that addresses the social aspects of the concept. With bioeconomy on the cusp of taking the forest sector into a new and uncertain future, there is an increasing need to understand the challenges and opportunities that this concept presents. As identified above, the bioeconomy concept – and the important role of forests in a bioeconomy – is well on the way to being established in literature, however the degree to which it is transitioning from science to forest policy is yet to be measured. Perceptions of bioeconomy, specifically by those in the forest sector, are one way in which this transition can be measured.

1.5 Aims

The overall aim of this thesis is to investigate the perceptions of bioeconomy and consequently examine its potential to influence the forest sector in Sweden. Specifically, the thesis aims to address the following research questions:

> R1. How do stakeholders perceive the bioeconomy concept and how do they articulate the role of forests within bioeconomy?
>
> R2. Based on current perceptions of actors, is bioeconomy evolving as bridging concept, a dividing concept or a boundary object for forest discourse?

2 Theoretical framework

In terms of its role as a driving force in the development of the forest sector, the concept of bioeconomy can be viewed in two radically differing ways. One view is to simply see bioeconomy as a progressive concept that re-frames the traditional economy, with a focus on the use of renewable natural resources, where the forest sector would naturally play a key role. This notion is supported by Pülzl et al. (2014) who states, *"the bioeconomy discourse itself has not overshadowed those identified classical forest discourses, but is likely to reframe their content."* If this were the case, then bioeconomy would be prioritised at a governmental level through public policy and subsequently trickle down to influence specific practices in forestry and forest industries. So far in Sweden, bioeconomy has been identified in terms of research priorities but is yet to be addressed through public policy (Staffas et al. 2013). Analytically, this perspective also presents a major challenge in terms of singling out the influence of the bioeconomy concept from other influences.

An alternative perspective is to view bioeconomy as one of the discursive vehicles for the forest sector stakeholders to pursue their interests in the policy arena. From this view, bioeconomy is much more than a economic or scientific development but, including those elements, it also encompasses a political aspect or as described by Goven and Pavone (2015: 3), a *"political project […] meant to bring about a particular set of political-institutional changes that will shape the parameters of possible future action"*. Similarly, Kleinschmit et al. (2014: 7) compares bioeconomy with other meta-discourses, using the term *"shades of green"* to describe their perception that different actors stress different aspects of the bioeconomy concept when using it in communication. Three ways that bioeconomy could be used as a discursive vehicle are as a (i) boundary object; (ii) a bridging concept; or (iii) a dividing concept (Figure 1).

i. A boundary object would mean the bioeconomy concept is plastic enough to adapt to varying needs and constraints of those employing it, yet *"robust enough to maintain a common identity"* (Star and Griesemer 1989: 393). This would imply that different actors, including forest industries, forest owners and environmental non-government organisations (ENGOs) widely embrace bioeconomy as a progressive concept, but assign it very different meanings, in accordance to their own values and interests. In this case, bioeconomy would be used in similar way as other fashionable concepts, such as sustainable forestry, multiple use forestry or ecosystem services.
ii. Alternatively, bioeconomy could serve as a progressive concept bridging the different interests between actors. Defined by Baggio et al. (2015), a bridging concept differs from a boundary object in that it *"actively links fields and stimulates dialog"*. An example used by both Davoudi et al. (2012) and Baggio et al. (2015) is the term resilience which can be seen as a bridging object as it bridges, or *"brings together in an integrative way […] the science and policy realms"*. In the case of the forest sector, bioeconomy could bridge the difference between actors whose interests have traditionally conflicted while realising a common vision for a progressive society based on renewable resources.
iii. A third way in which bioeconomy could eventuate is as a dividing concept, embraced by production-oriented actors but rejected by environmental actors, as too economically focused concept. As suggested by Goven and Pavone (2015: 3, 6), bioeconomy can be viewed as a *"political construct"* designed to protect and promote a *"neoliberal-capitalist accumulation regime"* and as such is used to advance political idealology. This would place ENGOs in an ambiguous situation, where they may accept bioeconomy as an overall

progressive concept towards greening the society but wary of its implications to forestry, potentially leading to intensified practices to the detriment of environmental values.

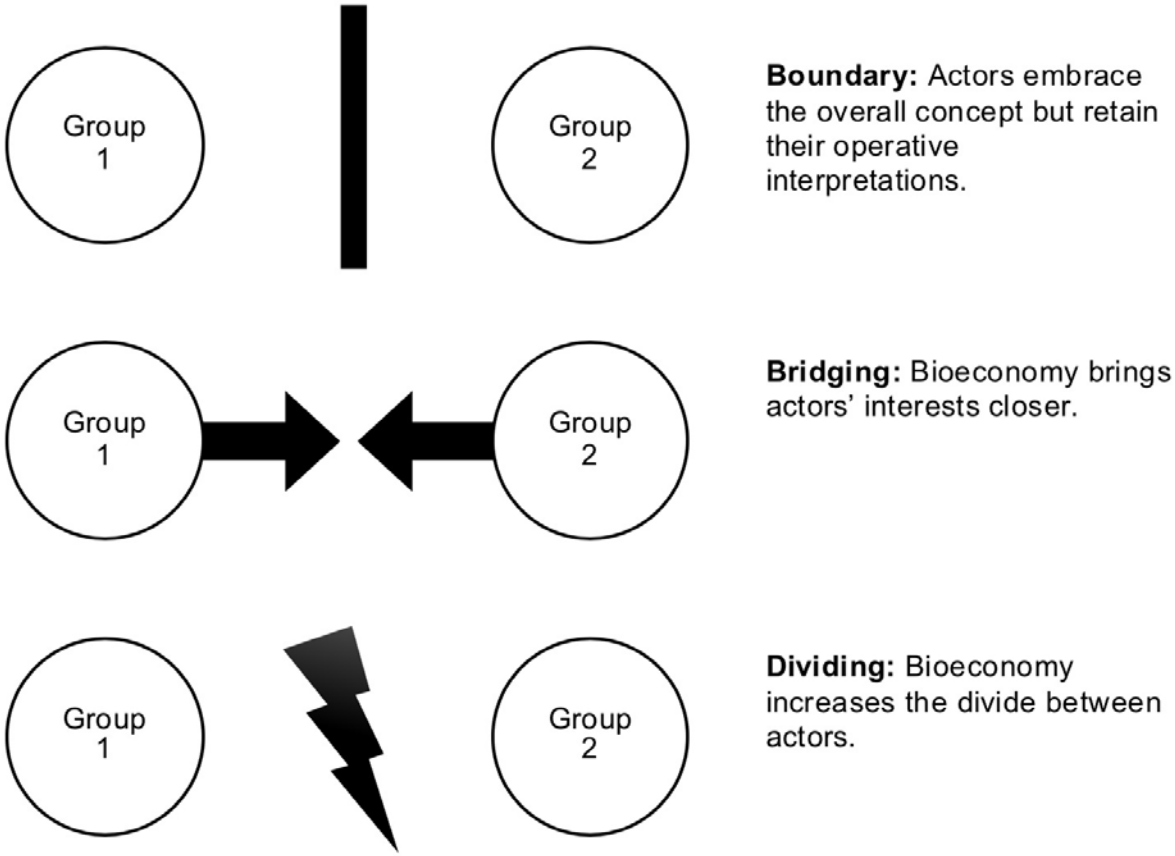

Figure 1. Simplified illustration of three potential interactions between two groups that the bioeconomy concept can facilitate.

3 Methodology

3.1 Data collection

As the core aim of this study was to investigate the range of perceptions that forest sector actors had of the bioeconomy concept, qualitative research interviews were chosen as the most appropriate method of research, with a selective sampling methodology used to target specific aspects of the forest sector. Selective sampling is a commonly used methodology in qualitative research and "refers to a decision made prior to beginning a study to sample subjects according to a preconceived, but reasonable initial set of criteria" (Sandelowski et al. 1992: 302). This approach acknowledges that both the organisations approached and the individuals interviewed in this study were chosen based on certain criteria.

Although using conversation for obtaining knowledge is not a new practice, qualitative interviews have only been used in the social sciences since the 20th century (Kvale and Brinkmann 2009). Interviews are now one of the most widely used methods in qualitative research as they provide an *"undiluted focus on the individual" (*Ritchie 2003: 36) and *"in-depth information pertaining to participants' experiences and viewpoints of a particular topic"* (Turner 2010: 754). Interviewing is an active process where the interviewer and interviewee, though their interaction, produce knowledge. As described by Kvale and Brinkmann (2009: 3) the aim of a qualitative research interview is *"to understand the world from the subjects' point of view"*. There are no strict methodological procedures or rules for conducting a research interview, however there are standard approaches and techniques that can be utilised in the course of interview-based research (Kvale and Brinkmann 2009; Turner 2010). The absence of a prescribed set of rules for interviewing creates openness and provides opportunities for the interviewer to make on-the-spot decisions but it also places demands on the interviewer's preparation and competence.

Interviews were conducted over a period between 28 October 2015 and the 5 January 2016. Organisations that are active within the Swedish forest sector were first identified with the assistance of both supervisors. Based on the premise that bigger is better, larger organisations were targeted with the assumption that, as larger lobby groups and forest producers, they are both more aware of international trends influencing forest policy and have a greater influence on the development of national forest policy. For example, organisations such as Lantbrukarnas Riksförbund (LRF) and Skogsindustrierna were included as they are organisations that represent large bodies of forest owners and industries, and consequently assumed to carry a larger influence in the Swedish forest policy arena. Based on the prerequisite that they were directly involved with either forest policy or forest management. Potential candidates within the selected organisations were contacted to arrange an interview. An additional criterion was that people that worked directly with forest policy were targeted e.g. forest managers and lobbyists rather than forest planners. Prior to the first interview, a trial interview was conducted with a supervisor to test both the interview design – technique and questions – and provide an estimated interview time.

Interview candidates were categorised – as industry, owner or ENGO – based primarily on how they identified themselves. Both LRF and Södra identified as owner associations while Svenska Cellulosa Aktiebolaget (SCA) and Skogsindustrierna were categorised as industry as they were either a private forestry company or lobbied on behalf of the forestry industry. While managing Sweden's public production forests, Sveaskog could have been identified as a forest owner, it owned its own mills and processing plants and therefore behaved more like a private forest company and

was consequently categorised in the industry group. The remaining organisations, Forest Stewardship Council (FSC), Greenpeace, Naturskyddsföreningen and World Wildlife Fund (WWF) were identified as ENGOs. Twelve respondents, four from each of the three categories, were interviewed (Table 1). As LRF, SCA and Södra were large organisations there were sufficient candidates to interview and still get a range of informed perspectives.

The study used a semi-structured approach with a set of interview questions designed to provide information relevant to answering the research questions, but also designed to be open and provide scope for conversation (Appendix 1). This approach is often described as the standardised open-ended interview, where participants are asked identical questions but the questions are worded so that responses are open-ended (Turner 2010). Standardised open-ended interviews are a popular form of interviewing used in qualitative research as the nature of the open-ended questions allows participants to fully express their viewpoints and experiences. In addition to the interview questions, each interview opened with some personal background and also project background, with the intent of making the interviewee more at ease and more likely to speak openly. Each interview concluded with an opportunity for the interviewee to add something not already said or to make a final comment. Each interview, which lasted between 20 and 45 minutes, was recorded and then later transcribed verbatim.

Table 1. Interviewed organisations.

Category	Organisation	Number of interviews
ENGO	Forest Stewardship Council	1
ENGO	Greenpeace	1
ENGO	Naturskyddsföreningen	1
ENGO	World Wildlife Fund	1
Industry	Skogsindustrierna	1
Industry	Svenska Cellulosa Aktiebolaget	2
Industry	Sveaskog	1
Owner	Lantbrukarnas Riksförbund	2
Owner	Södra	2

3.2 Data analysis

Similar to conducting qualitative interviews, there are no clearly agreed protocols or procedures for qualitative data analysis, there are however some commonly used approaches (Spencer et al. 2003). In order to answer the two research questions, two approaches were used to analyse the data produced by the transcribed interviews: content analysis and frame analysis.

3.2.1 Content analysis

The content of each interview was analysed to identify themes that were common within each of the three actor groups – ENGO, industry and owner. The identification of key themes is a common procedure utilised in the analysis of qualitative data (Kvale and Brinkmann 2009; Spencer et al. 2003). These themes were then categorised as being new opportunities for the forest sector provided by a bioeconomy or forces that were either driving or inhibiting the progression of a bioeconomy – drivers, obstacles and opportunities.

3.2.2 Frame analysis

Frame analysis was used to explore actor's perceptions of bioeconomy. Frames are defined in a variety of ways but can be described simply as an actor's understanding (Lindahl 2015). Two functions that are common to most are that they organise central ideas, including an actor's perspectives, and emphasis certain aspects (Nisbet and Mooney 2009). Entman (1993: 57) elaborates further you stating, "*the major task of determining textual meaning should be to identify and describe frames"*.

Frame analysis delves deeper than identifying common themes as it encompasses the entire tone, context and impression portrayed by the interview, as well as the transcribed text, to provide an answer. As described by Entman (1993: 51) frame analysis is a technique that *"offers a way to describe the power of a communicating text"*. Typically it provides a way to investigate an actor's organisation of experience and the action biases they promote (Entman 1993). Identifying frames from the transcribed interviews allows an understanding of how the concept of a bioeconomy is perceived and used by the various actors interviewed. Once identified, the frames were then used to categorise the actor's perception of bioeconomy as being either a bridging, dividing or boundary object.

4 Results

Analysis of transcribed interviews yielded two types of data, general themes and frames. The first was presented as responses that defined bioeconomy and the drivers, obstacles and opportunities related to a bioeconomy. These results are summarised in Table 2. The results of the frame analysis were used to describe the context and overall perceptions of a bioeconomy concept and answer the question of whether the bioeconomy concept was being used as a boundary object or a bridging or dividing concept. These results are summarised in Figure 2.

4.1 What is a bioeconomy?

In general bioeconomy was perceived by all three stakeholder groups as something positive. Bioeconomy was described by the industry group as *"a positive word"*, *"a vision…for Sweden and for the world"*, *"a modern word and positively viewed by society"* and *"a word with meaning for society"*. Likewise it was identified by the ENGO group as *"something that is a very vital and necessary part of a sustainable society"* and the owners as *"a positive thing […] will help us move forward"*. These descriptions all supported the notion that bioeconomy was perceived as something progressing both the forest sector and society as a whole towards a *greener future.*

Similarly, all three groups agreed that bioeconomy is an economy or a society based on the use of biological raw materials or as defined by an ENGO, *"the part of [an] economy built on the sustainable production of renewable materials from nature"*. Some ENGOs went further to recognise it as a *"subcomponent of a renewable society"* where renewable materials replace *"non-renewable materials as much as possible"* but all identified that in Sweden, bioeconomy primarily means utilising the forest. Owners also recognised that bioeconomy represents *"a shift from the industrial fossil based economy"* as did ENGOs stating, *"[it] implies […] a transition of the economy from the present one"*. All three groups defined bioeconomy as including both current traditional forest products – timber, pulp and paper products - as well as newly developed products that have arisen from recent technological advances, with owners recognising that *"we are already in a bioeconomy"*.

Bioeconomy was viewed as a global concept that responded to the global issues of resource limitation and depletion and climate change resultant from increasing carbon emissions. As a consequence, rather than viewing Sweden's forests in isolation, bioeconomy promoted a perception of forests as global resource. As identified by one interviewee:

> *[…] if we really are going to build this renewable society [in Sweden] where forest biomass plays a big role […] there are potentials to increase biomass production globally as we have deforested areas, degraded forests, etc. so there is a great opportunity internationally to increase biomass production. – ENGO*

Although the ENGO group described bioeconomy as *"basically something all environmental organisations have been working with for a long time"* the industry group appeared to exhibit a strong affinity with the term, describing it as *"a word that summarises our efforts and vision"* and even going as far as to say *"we are the bioeconomy"*. Another difference was that the ENGO group appeared to see bioeconomy as an opportunity for society to change, whereas the industry group and, to a lesser extent, the owners group seemed to perceive it as more of an opportunity for the forest sector to contribute to society change, saying *"our ideas and our mission has not changed but the wording has changed"*.

All groups saw bioeconomy as a real phenomenon although one ENGO added the caveat that it was also *"used in political rhetoric without more thinking behind what's in the concept"* indicating that its potential to induce changes was largely limited by how it is defined and who uses the term.

4.2 Opportunities, drivers and obstacles for a bioeconomy

4.2.1 What opportunities does a bioeconomy present?

Communication tool

Bioeconomy was seen as a communication tool both to inform society but also to promote the forest sector. ENGOs recognised that as a term, bioeconomy could be used to inform people *"who don't have a lot of knowledge about environmental issues or sustainability issues and who have difficulty seeing solutions"* and that it can be used to *"get other people who are not normally interested […] interested in something they weren't before"*. The industry group saw that it also "sets *the focus on the meaning of forestry and agriculture and that use of natural resources for the economy"*. The term was also seen as a label that could be used by businesses to articulate their practices, process and products that use renewable materials. The industry and owner groups also saw the term as an opportunity to both *"to tell our story and show how good our products are"* and that it *"makes the whole sector more accepted"* by showing that the forest sector is part of a *greener future*.

Improved forest management

The ENGO group also recognised that the bioeconomy concept as an opportunity to develop new products but also as an opportunity to develop "new ways to use the forest" stating that:

> *[Bioeconomy] could also be start for something new to actually change something, an opportunity to change […] towards maybe a little less pulp, a little more energy and other new products. – ENGO*

This response was similar to the industry, as it recognised the concept as an opportunity for new products, but with a slightly different motivation. The ENGO group saw new forest products as an opportunity to move away from traditional products, such as pulp, towards alternative, more *environmental* products like ecotourism and other service-based forest products. This perspective was emphasised by one ENGO interviewee who said *"cutting down trees is not the only way to get money from the forest"*.

4.2.2 What are the drivers for a bioeconomy?

Climate change

A major reason identified by all groups, that promoted the concept of a bioeconomy, was climate change. All groups recognised bioeconomy as *"an important part of the solution"* with one interviewee stating that:

> *We must substitute fossil fuel based raw materials and energy for something that is more environmentally friendly and sustainable. – Industry*

Bioeconomy represented a solution for the increasing levels of atmospheric carbon associated with climate change as it provided a way of transitioning from fossil fuel based energy and products and consequently reducing carbon emissions and increasing carbon sequestration. This process of replacing non-renewable products with renewable is referred to as substitution. Bioeconomy, for many of those interviewed, simply meant substitution of current fossil based energy and products with renewable biobased alternatives and consequently, a mechanism to reduce the escalating amount of atmospheric carbon. This was emphasised by one interviewee who equated the development of a bioeconomy to substitution saying:

[…] it's also a word in society that we must develop a bioeconomy, like an understanding that we must substitute for fuels and things like that. – Industry

Although there was consensus between the three groups, within the ENGO group not all interviewees agreed. One ENGO representative regarded *climate change,* when used as justification for forestry, as being a "*rhetoric [that] pushes"* increased forest production e.g. fertilisation and use of exotic fast growing species.

Sustainability

Linked to the notion of bioeconomy as a solution for climate change, is the perception of bioeconomy as part of a sustainable society. All three groups identified sustainability as a driver for a transition to a bioeconomy, saying that:

[…] population in the world is growing more people and people getting more wealthy, so to be able to increase the wealth in the world we need to work on the renewable part because otherwise we won't have a sustainable planet. – Industry

[Bioeconomy] is a very vital and necessary part of a sustainable society. – ENGO

Sustainability, circular economy and the carbon dioxide problem, [forestry is] part of the solution for all of those three things. – Owner

This driver was closely related to the *climate change* driver as they were both based on the premise of replacing non-renewable products with renewable biomass based products however the difference was that this driver was seen as a necessary response to increasing population demand and limited resources instead of a means of reducing carbon emissions.

Economic development

Economic development was as perceived as both a motivation to change but also an opportunity to develop new products and markets. All three groups identified new products and market opportunities as a primary motivation for developing a bioeconomy. The industry group in particular emphasised the importance of economic drivers stating that:

[…] a main driver for me and for the company and for Sweden is that it's a good business. We have a lot of forests, we know how to use them, we know how to develop them and a tradition of successful chemical industry development based in natural products like pulp and paper, a lot of that comes from Sweden, we have a strong intellectual capital in this sector. – Industry

[…] being able to make this transition to a new economy, a bioeconomy, [is] vital for survival. – Industry

[…] international markets, prices, exchange rates, [economic] growth, it's the normal drivers. – ENGO

[…] if you want to stay alive in this business, you have to have some kind of development. – Owner

Although economy was primarily seen as a rationale driving the development of a bioeconomy, it was also recognised as an opportunity by the industry group as *"a way to find new markets and new products and new ways of using this raw material"*. In this regard, bioeconomy was seen as a natural development of the forest sector, as two interviewees stated:

It's [bioeconomy] a term that's been popular when talking about progression and development of our own industry. – Industry

Over time we have changed focus from timber to pulp and to paper […] that market is going down so we must find new values for the forest. – Industry

Regulation

Although regulation as a policy tool was also identified as a potential inhibitor for a bioeconomy, the ENGO group saw it as a potential driver saying that *"regulations from the [European Union] level and the national level, that are in favour of bioeconomy, sustainably produced products"* could promote a transition to a bioeconomy or in the words of an interviewee *"by stopping the bad things you are actually boosting the good things"*. Although it was recognised by an ENGO that *"people want to be eco-friendly"* there was a perceived need for regulation because *"we don't have time for everything to be so eco-friendly as possible in the world, have to move it on a bit"*.

Regulation was also identified by an ENGO as a necessary "mechanism to steer [… and] optimise the use of biomass in society". However it was also noted by the same ENGO that the use of "taxes or other mechanisms to steer that use of biomass […] might be in contradiction with certain sectors". One example used to illustrate this was:

[…] if you have the pellet sector, the biomass from that goes directly to pellets and then we just burn it rather than steering that biomass into more long term products and then burning it but then the pellet sector would oppose that because it would undermine their business. So that is obviously a challenge also, how society can steer this in a more optimum manner. – ENGO

The industry group recognised regulation both as a potential obstacle but also that *"national and international policy"* were a necessary driver to *"to promote new ideas and transform society"*.

4.2.3 What are the obstacles for a bioeconomy?

Urbanisation

Increasing urbanisation was cited as one of the major obstacles that could prevent progress of a bioeconomy. Both the ENGO group and the owner group recognised urbanisation was a major issue with a forest owner describing it as:

A problem is urbanisation […] in Sweden, people love wood products but they don't love forestry and forestry is a dirty sounding thing with machinery out in our nature which is not nice but then after two or five years when the new forest is growing and you have your wooden kitchen table they are happy. – Owner

Urbanisation was perceived as an issue as it represented a society disconnect from the natural environment as an owner stated:

Global urbanisation, meaning fewer and fewer people have actual knowledge and experience of country lifestyle and what it is to manage land and what it is to be a farmer and they are being taught at the universities, all these ideas about what nature is and how it should be managed and fewer and fewer really know what it's all about and how to take care of it. – Owner

This disconnect was consequently related to a decreasing understanding and appreciation of nature, in this case forest, which was the reason urbanisation was perceived as a problem for valuing forests and the services and products they produce. One interviewee summed this up as:

[…] understanding of the forests and their environmental values and ecosystem services is deteriorating I would say and that would then potentially undermine the forest push that we manage them sustainably. – ENGO

Regulation

Both the industry and owner groups both saw regulation as a potential hindrance for a developing bioeconomy. Bureaucracy in general was identified as an issue because it could make forest utilisation more complex and difficult for forest owners or as stated by an owner, "you can end up with so much administration that forest owners will not harvest". Similarly regulation was seen as an economic burden with a stated concern that:

[…] politicians in Sweden or in the European Union or at least UN conventions, if they put too much of obstacles and too much hinders and too much burden on the sector with all kind of requirements that doesn't make it profitable anymore. – Owner

[…] if there are regulations forcing us to explain everything there will be a lot of paperwork and a lot of paperwork means that there'll be less biomass on the market because there will be forest owners, if you think about the small forest owner, just a little piece of land, it will be too much paperwork so he will just feel that 'ah, forget about it'. – Owner

More specifically, regulation was perceived as a potential obstacle for a developing bioeconomy in that policies didn't distinguish biobased energy from fossil based energy. According to one industry interviewee the European Union *"don't make any difference if the product is renewable or fossil […] you can't, for example, put a tax in a way that makes it cheaper to choose the renewable"* and as a result it was *"cheaper to import fossil fuels than to use renewable ones"*.

Resistance

In addition to regulation, industry and owner groups also identified resistance, both from current structures and from competing economic interests, as an impediment for a transition to a bioeconomy. Resistance from current structures was referred to by an industry interviewee as the *"resistance to new building technologies and the use of massive wood constructions in tall buildings for example and that is both structural, because it is what we are used to doing"*.

Resistance from competing economic interests was also perceived as an obstacle for further development of a bioeconomy. Owners in particular stated that:

There are institutions and sectors that are against the use of forest. We have primarily the oil industry, they are not very interested in having biofuels and you have the construction sector. – Owner

[…] very strong economic interests, which use lobbies and politics to promote their own products. That has been seen in the last 100 years of innovation, for example alternative fuels and motors for cars, which have been bought by fuel and car companies so that has been inhibiting new ideas for a long time. – Owner

Resource limitation

When it came to viewing the forest as a limited resource for a developing bioeconomy, there was a gradient of decreasing concern from the ENGO group to the owner and industry groups. The ENGO group promoted the view that forest use is already at a limit, saying:

> *Sweden has already made the transition that was possible […] forest is already being over exploited, if we want use more biomass for fuels then something else has to give […] should we start using our agricultural land to produce biofuels instead of food? Somewhere, somehow there has to be a change in the consumption patterns. – ENGO*

The owner group also recognised that in Sweden *"we are cutting as much as we can"* but identified that there was potential to increase growth, for example with *"better seed orchards, more dense stands, we could do things"*. The industry group focused solely on increasing productivity and efficiency, viewing forest as a global resource that can be increased, stating that:

> *I'm expecting an even higher ambition in the silvicultural field. We can still do a lot more to have more productive forests and produce a bigger volume so we can do more products. – Industry*

Definition

Both the owners and the ENGOs identified the definition of bioeconomy as an issue. The reasons it was perceived as an obstacle were that it was both a broad definition and consequently could be either open to interpretation or ambiguous. As stated in the interviews:

> *It's a very unspecific concept […] anyone can say it and you don't know what it really means. There is no one that really owns the concept so it's open for anyone to interpret and claim. – ENGO*

> *[…] if we don't know what we're talking about when we're using a term like bioeconomy, then it's a problem. – Owner*

The definition of bioeconomy was also described as "*sloppish*" by an ENGO, indicating that it was vulnerable to being treated as a buzzword if there was a lack of knowledge and understanding to support the concept.

Table 2. Summary of opportunities, obstacles and drivers identified by interviewed groups.

	ENGOS	INDUSTRY	OWNERS
OPPORTUNITIES			
COMMUNICATION TOOL	X	X	X
IMPROVED FOREST MANAGEMENT	X		
DRIVERS			
CLIMATE CHANGE	X*	X	X
ECONOMIC DEVELOPMENT	X	X	X
REGULATION	X	X	
SUSTAINABILITY	X	X	X
OBSTACLES			
DEFINITION	X	X	X
REGULATION		X	X
RESISTANCE		X	X
RESOURCE LIMITATION	X		X
URBANISATION	X		X

* There was not unanimous agreement within the group for this topic.

4.3 Is bioeconomy being used as a bridge, boundary or divide?

In general there was a common understanding of bioeconomy between the groups although it would be premature, based on that, to interpret bioeconomy as a bridging concept. Delving deeper, the interviews exhibited a range of understandings and as a result, there was no clear distinction between the groups in terms of the concept being used as a bridging, boundary or dividing object. Instead perceptions of the bioeconomy concept were more a function of individual understandings rather than common group beliefs. This was perhaps most evident within the ENGO group which even had contradictions between members, illustrating the diverse nature of this group. As a result there was evidence to support all three understandings – boundary, bridge or divide – within each group (Figure 2). However of the three, this study showed that bioeconomy as a bridging object had the most support.

Bridge

Of the twelve interviews, six displayed an attitude that showed the bioeconomy concept could be regarded as bridging. Noticeably, this group was dominated by the ENGOS. The fact that bioeconomy was perceived positively by all three groups is the first clue that supports the hypothesis of bioeconomy as a bridging object. There was recognition from both industry and ENGO groups that it was important to have a common understanding as some interviewees stated:

> *We have to make it a concept that we can work on together as a whole society, not one [industry] bioeconomy and state bioeconomy, one nature organisation bioeconomy, we need a common base in the vision. – Industry*

> *If we use them just to reach our own political goals and thereby neglecting there are other stakeholders that might perceive it I another way, it's not going to be very constructive so I think you have to have a more profound discussion about bioeconomy is […] focus on how renewable natural resources can be managed to actually contribute to a sustainable bioeconomy […] solving how we can build a renewable society. – ENGO*

> *It also makes the whole sector more accepted, that it's part of the future, it's important for us to redefine ourselves and become a part of the future […] in a way it's an important word in how we coin it and the way we use it but I think it's a word that summarises our efforts and vision. – Industry*

There was also a common recognition that, in Sweden, forest biomass provided the only viable alternative for fuel, plastic and textile replacement products with one owner commenting *"you can't sit on sunlight"* which illustrated that although solar power might provide a suitable energy alternative, of the renewable options, forest biomass was the only one appropriate for a range of other replacement products.

Deeper than commonalities, any indication that the bioeconomy concept included a shift in attitude was a sign that the concept provided a bridge between traditionally disparate groups. For example, ENGO actors seeing bioeconomy as pathway towards using more forest products or industry actors recognising a need for changes in forest management as illustrated by the following statements:

> *It's important for us to redefine ourselves and become a part of the future. – Industry*

> *It's something that is very vital and necessary part of a sustainable society […] new products but also new ways to use the forest. – ENGO*

It's good, better, to use more fibres to replace other things in building […]– ENGO

[…] there are many different interests that use it for their purposes of course but still it is a shift from the fossil based, it is a shift from a traditional industrialised economy and perhaps that implies as well a little bit more of a knowledge based society, a service based society. – Owner

Boundary

Bioeconomy as a boundary object was supported by five interviews. Owners in particular supported the notion of bioeconomy as a boundary object, with three of the four owners interviewed regarding bioeconomy synonymously with forestry. This view indicated that there was no need for change, counter to attitudes that supported bioeconomy as bridging object, and instead was tool for society to accept forestry as it is. This perception is summarised by the following statements from interviewed owners:

We are the bioeconomy. Our ideas and our mission has not changed but the wording has changed […] it would be good if people could realise that so they have a better understanding of what we do. – Owner

We're a part of the solution. – Owner

It's a very good thing that people have realised the potential of forestry. – Owner

It gives the possibility to tell our story and show how good our products are. – Industry

It's [bioeconomy] a word that summarises our efforts and vision. – Industry

Some want to conserve forest as a carbon sink but I think bioeconomy sets the focus on the meaning of forestry and agriculture and that use of natural resources for the economy. – Industry

These statements all illustrate how owners, and industry to a lesser extent, perceived bioeconomy and forestry as one and the same, with it simply being a new word that conveyed a message of how good it is to use the forest without any impetus to change.

Divide

Of the three approaches that bioeconomy could be used, a dividing object had the least support with only one ENGO interviewee giving nominal support to this approach. The main reason this interview was categorised as dividing is that bioeconomy was perceived as "*rhetoric"* used to support increased forest production, as stated:

There is a lot of lobbying about the role of forests in climate mitigation, in bioeconomy […] the forest industry and others have used climate as an argument to increase production, you can name any number of things, increase fertilisation, more exotic species or they want to do stump extraction. The rhetoric's of renewable, climate, bioeconomy, pushes those things. – ENGO

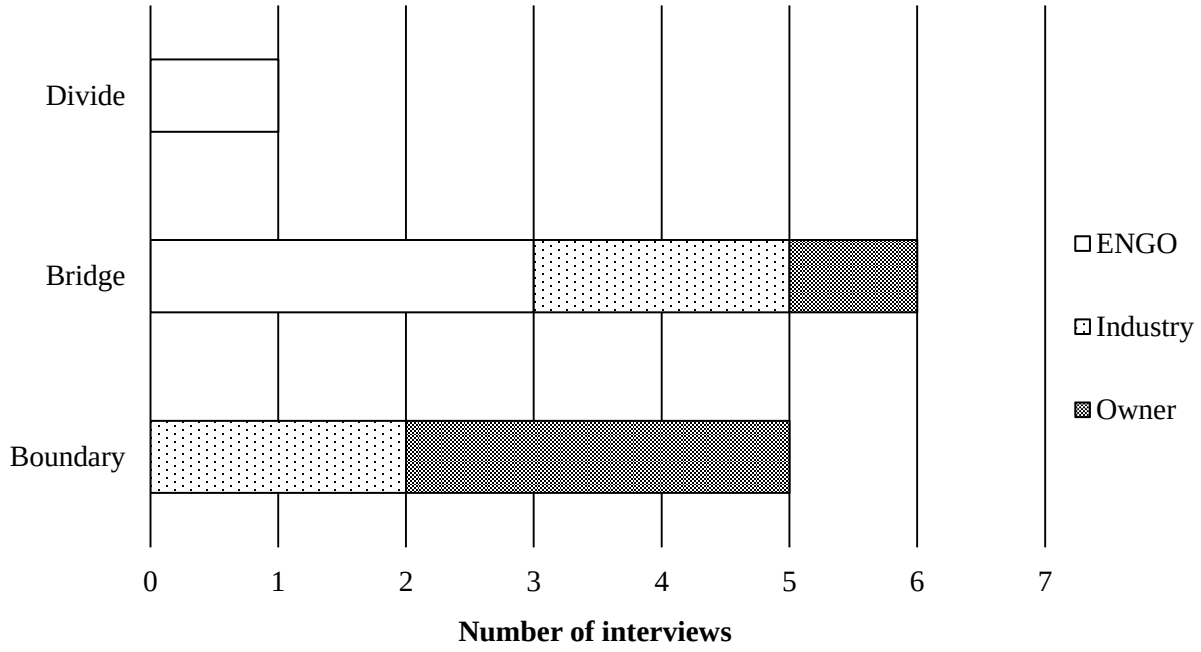

Figure 2. Summary of bioeconomy perceived as a boundary, bridging or dividing object for each of the three groups interviewed.

5 Discussion

5.1 Broad definition

Bioeconomy has a broad definition. From the interviews, the bioeconomy concept was understood to be a process that used biomass to transition society towards a more sustainable, greener future. This view is more reflective of the European Union view of bioeconomy which is *"based on the use of use of biomass resources"* as opposed to the definition used by the OECD and the United States which *"focus on the process converting raw material into value added products using biotechnology"* (Kleinschmit et al. 2014: 6). The fact that each person interviewed could define bioeconomy illustrated that the concept has pervaded forest discourse in Sweden. However, although all perceived the concept positively only a few exhibited an understanding deeper than a vague sense it implied a push towards a more sustainable society. Staffas et al. (2013: 2766) also concluded that the bioeconomy concept is not well defined and that *"in some cases it is a more political approach and, in others, a more scientific approach"*.

The broad definition could imply that the concept is still in its infancy and needs to be further defined before it can begin to influence forest policy. Alternatively, the openness of the definition may be a strength and a consequently a reason why the concept had universal acceptance between the diverse groups interviewed. This positive commonality was the primary reason that justified the concept being used as bridging concept, providing common ground and goals for groups with previously conflicting interests. Kleinschmit et al. (2014: 19) also identified that integration of forest and environmental management necessary for a bioeconomy could diminish *"the traditionally strong actor-coalitions of the forest sector"* further illustrating that the concept has the potential to bring actors together. Although, for this to eventuate in Sweden will depend, at least in part, on how a national bioeconomy strategy develops and whether its used as an opportunity to involve all actors.

Not all saw it in this way though. The openness of the concept also provided scope for groups to interpret bioeconomy in their own ways, treating it as a boundary object. Described by Kleinschmit et al. (2014: 7) as *"shades of green"*, where different actors stress different aspects of the concept, this was seen predominantly within the forest owners who interpreted bioeconomy as a validation of using forest products and as a consequence, perceiving themselves as synonymous with bioeconomy. This view is also promoted by Swedish Forest Industry Federation (2012: 25) in their report where they describe the forest industry as the *"driver"* for a sustainable bioeconomy. Although in some regards this view may be accurate – as forest owners supply raw forest material – it implied a normative resistance to any change from a traditional forest management model. This resistance has been identified previously by Krott (2012) who observed that forest owners may represent a challenge for the forest sector to progress a bioeconomy as they are not simply driven by profit – which would motivate delivery of biomass to the industry - but also value forest utility, which is in line with notion of *forest pride* exhibited by this group.

This difference in attitude, that distinguished the forest owners from the other two groups, was one of the more significant results found by this study. Although the scope of this study was limited to the forest sector, an attitude that equates bioeconomy with forests and forestry – not altogether surprising in a country where the forest sector is so dominant – could present issues for widespread adoption of the concept in Sweden. The reason being that it fails to recognise the potential contributions of other sectors, such as agriculture, and may cause conflict between sectors whereas, as a cross-sectoral concept, bioeconomy requires an holistic approach to be successful (Kleinschmit et al. 2014).

5.2 The next evolution?

There is growing evidence to suggest that bioeconomy is the next evolution in meta-discourses to influence forests. Forests – and their management – have long been at the mercy of global trends and discourses but two major discourses that have recently influenced forests are *ecological modernisation* and *sustainable development* (Lindahl 2015; Pülzl et al. 2014). Bioeconomy – as a discourse – contains elements of both ecological modernisation and sustainable development meta-discourses, with innovation and technological advancement a key component of a bioeconomy that also acknowledges natural limits by promoting an alternative to non-renewable fossil resource dependence. For this reason bioeconomy has been described by Pülzl et al. (2014: 391) as a "*mixed-source discourse*" stating that:

> *[Bioeconomy] cannot be subsumed under other already existing meta-discourses such as the sustainable development or ecological modernisation discourse. It is however also not just another meta-discourse that aims at replacing older ones.*

This notion of bioeconomy as a mixed-source discourse was supported by those interviewed in this study. The attitudes expressed in interviews supported the understanding of bioeconomy as an amalgamation of previous meta-discourses as also identified by Pülzl et al. (2014: 391), the bioeconomy discourse "*interweaves arguments of doom (limits to growth) with technological arguments (ecological modernisation) and economic arguments (neoliberalism), while being concerned mostly about the economy"*. Climate change and sustainability were recognised as primary motivations to develop a bioeconomy. These drivers acknowledge natural limits – in line with the sustainable development meta-discourse – as they represent the challenges of carbon emissions, resource depletion and population growth that bioeconomy is seen as a solution to. Simultaneously, although one ENGO expressed concern at forest overuse, there was little sense from those interviewed that there was any need for change in production or consumption behaviour. Rather there was an expectation expressed that technocratic solutions such as tropical plantations, fertilisation and improved genetic material will help meet future demands. Life went on, just with timber buildings and pine diesel fuelled vehicles instead of concrete and petrol. Whilst environmental aspects of bioeconomy provided justifications for the concept, it's not possible to disregard the economic motivation also expressed by those interviewed. All three groups cited opportunities for new products and markets, illustrating that it was a significant driving force for developing a bioeconomy.

Lindahl et al. (2015: 11) describes this attitude as the *"more of everything pathway"*, an *"optimistic view that it is possible to create more of existing resources"* and subsequently, this perception of a bioeconomy can be seen as an extension of the Swedish forest model that has traditionally prioritised wood production. Further, it is possible that the similarity of the expressed understandings of a bioeconomy with the current forest model is a reason that the concept had such widespread acceptance amongst those interviewed.

5.3 Global governance

Bioeconomy was presented as a solution to the global challenges of resource depletion and climate change. These can be seen primarily as products of the global trends of a growing population – both in numbers and wealth – increasing demands on the planet (Eckerberg 2015). As a consequence, forests were perceived by many of those interviewed as a global resource. Among the interviews there was recognition of Sweden already being at a limit in terms of forest utilisation – although some saw potential to increase this limit – and that to meet increased future demands for forest biomass there would need to be an increase in biomass production globally. This recognition of natural limits was also a recognition of bioeconomy as a full transition from fossil fuel based products and energy which could be differentiated from the view, mainly exhibited by the forest

owners, that Sweden already has a bioeconomy by simply having forests – and other sources of biomass – contribute to the economy.

The perception of forests as a global resource illustrates the increasing role of international governance in the Swedish forest sector. Internationalisation of the forest sector is not a new phenomenon for Sweden, with many of the organisations interviewed operating globally. SCA, for example, is the largest Swedish forest company but produces in 25 countries and sells to more than 100 countries (SCA 2016). Kleinschmit et al. (2012: 127, 128), in their review of forest policy research, identified the increasing prominence of governance as a research topic, also recognising that the forest sector in Sweden is increasingly affected by "*by decisions taken beyond Sweden's borders*" which "*merit increased attention in the future and continues to influence forest policies at the national level*". The increasing importance of international governance in the Swedish forest sector was recognised by many of those interviewed, with several emphasising both negative and positive aspects of regulation and other policy instruments in progressing a bioeconomy in Sweden. International governance was primarily identified as the European Union, for example the current European Union policy goal of increasing the amount of energy sourced from renewables to 20% by the year 2020, which in turn influence national policy (EC 2011). International governance also includes the increasing influence of multinational organisations such as FSC, which has a significant role in influencing forest management in Sweden through its certification scheme. Regulation also highlighted the tension between the energy and forest sectors with one interview emphasising a lack of discrimination in European Union policy between renewable and non-renewable fuels. This illustrates the multi-sector nature of a bioeconomy and consequently the need for a holistic approach to policy-making that includes cooperation between sectors, as also emphasised by Kleinschmit et al. (2012: 128), "*with a marked increase in inter-sectoral relationships, such as environmental, energy, agriculture or climate policies, the cross-sectoral dimension will become even more important*".

5.4 "It's a buzzword, but a useful buzzword."

In conclusion, I return to the original question posed by the title, green future or greenwash? The positive perceptions of the concept provided a very optimistic view that bioeconomy, at least for Sweden, really is the seen as the future. These perceptions support the notion of bioeconomy as a natural extension of the traditional Swedish forestry model and consequently support an expectation that the concept of bioeconomy will continue to gain widespread acceptance and influence within the Swedish forest sector. This influence can already be seen in the actor groups interviewed in this study that, in general, perceived it as way towards a green future. Whether motivated by a need for society to be sustainable or a need for the industry to survive, all of those interviewed saw it as a desirable future. Both industry and ENGOs saw bioeconomy as a way forward, to progress. Owners instead, although they also recognised it as a pathway to a sustainable society, viewed bioeconomy more as a description of their current state – without any impetus to change – and conversely perceiving bioeconomy more as a pathway for society to progress towards them.

The definition of bioeconomy was a two-edged sword in that it was broad enough to both support a range of agendas and encompass a range of – sometimes opposing – actors. For this reason it was used as both a boundary and a bridging object. Despite this difference in perspective, the broad acceptance of the concept highlighted the potential of bioeconomy as a bridging concept, bringing together a diverse range of forest actors, as one interviewee stated, "*it's a buzzword, but a useful buzzword"*.

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Appendix 1

Background
Briefly describe your current position and what it involves?
What is you organisation's role within the forest sector?

Definition
How would you describe the general concept of bioeconomy?
In what contexts have you encountered the concept of bioeconomy previously?

Bridge, divide or boundary
Do you think the bioeconomy concept helps to progress towards a 'greener' society?
Is it simply another buzzword or does it represent real potential to influence the way in which forests are viewed by society?
Do you believe that, in the forest context, the concept places more of an emphasis on either environment or production?
Do you view bioeconomy as an opportunity for the Swedish forest sector?
What do you see as the main drivers for the Swedish forest sector to progress society towards a bioeconomy?
What do you see as the inhibiting factors?

Forest management
Do you expect an increasing demands on the forest in the future?
Would you expect this to have an influence on forest management in Sweden?
Do you expect increased need for forest conservation in response to increased production?

Policy or market
What do you see as the primary incentives for development of new bio-based technologies and products?

Final comments?