PUBLIC PERCEPTIONS OF BIOFUELS

Case Study: Frames of Biofuel Discussion in the Finnish Context

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Summary

Biofuels are fuels made of biological materials and they can be used in cars, trucks and other engines. The EU's policy and regulatory framework for bioeconomy and biofuels is seen as a multi-layered and complex issue. Policies around biofuels have developed recently in the EU. Renewable Energy Directive II established a binding target for the use of renewable energy across the European Union by 2030 to be 32% of the total energy production. Finland is a country where the utilization of forest biomass has traditions ranging back centuries and continues in the present day with bioenergy holding a central role in the Finnish energy matrix. Our case study is focused on examining the public perceptions of biofuels in Finland and is linked to the discussion about climate change, global warming, and sustainable development.

We used a stakeholder approach and mapped key stakeholders in the biofuel sector in Finland from six stakeholder categories: corporations, governmental actors, non-governmental organisations (NGOs), municipalities, universities, and the media. We selected 59 online publications for our analysis from a time period between 2010-2019. Frame analysis was conducted using three pairs of polarised frames: environmental positive and negative, economic positive and negative, and technological positive and negative.

The results show that for the most part the framing of biofuel discussion in Finland is positive and emphasizes the environmentally and economically positive aspects. The negative aspects that came to front are especially in the notions of economic costs and in arguments for environmental calculations. The EU legislation itself is seen as a background to all this discussion and is itself not scrutinized extensively by the various stakeholders.

Keywords: biofuels, frames, public perceptions, European Union, public policy

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1 INTRODUCTION

The 2030 Climate and Energy Framework adopted by the European Council in October 2014 aims at cutting greenhouse emissions by at least 40% from the levels of 1990, increasing renewable energy use by at least 32%, and improving energy efficiency by 32.5%. The member states of the European Union are obligated to draft integrated National Energy and Climate Plans (NECPs) and to strive for an inclusive governance system where different stakeholders and citizens are consulted. A number of integrated regulative instruments are harnessed for meeting the targets, and the European Union is reshaping public policy and regulatory frameworks in the bioenergy sector, where “Finland is committed to promote the transition to sustainable biofuels in heavy goods vehicles and air transport” (Finnish Government, 2019). In Finland, “the use of biomethane would make it possible to run the entire truck traffic without the use of fossil fuels” (Pääkkönen, Aro, Aalto, Konttinen, & Kojo, 2019).

Regulatory frameworks are entangled in their political contexts. The European Union’s bioenergy policies are subjects to complex debates (Romppanen, 2017). Public perceptions, which media coverage influences, shape political outcomes (Lee, McLeod, & Shah, 2008; Lyytimäki, Nygren, Pulkka, Rantala, 2018; Hammond, 2018; Govinda & Hasanagic, 2018; Repo, Anttinen, Mykkänen, & Lammi, 2018). Media frames guide citizens’ interpretations of policy issues and shape public perceptions, and they ultimately try to influence the desirable policy outcomes (Lee et al., 2008; Delshad & Raymond, 2013). This requires multi-sectoral deliberation of national priorities and global climate objectives.

In this case study we will examine how the key stakeholders in Finland shape public perceptions of bioenergy and, in particular, debates on biofuels through media frames in key channels. The concept of issue dualism assists in presenting the polarization of the public debates regarding biofuels (Lee et al., 2008) and is used in our case study to explore the frames in more detail.

2 RESEARCH SETTING

2.1 Biofuels in European Union Climate and Energy Framework

Biofuels are liquid and gaseous fuels that are manufactured through contemporary processes from biomass, and often divided into first generation and advanced biofuels. Production paths of second-generation biofuels include waste materials and forest-biomass. According to Selin and Lehman (2018), “the liquid biofuel in greatest production is methane, in particular, in the United States. The second common liquid biofuel is biodiesel that has found greatest acceptance in Europe. Other biofuels include methane gas and biogas”. Biofuels provide renewable alternatives for petroleum and other fossil fuels and are part of the European Union Climate and Energy framework.

The European Union adopted the Renewable Energy Directive (2009/28/EC) in 2009. The 2020 Climate and Energy package was launched after RED I. By 2020, the European Union is aiming for renewable fuel to comprise 10% of all transport fuel in every member state, and suppliers are expected to reduce greenhouse gas intensity of the EU fuel mix by 6% by 2020, compared to the levels in 2010. The Revised Renewable Energy Directive (RED II, Directive 2018/2001) came into force in December 2018. RED II established a binding target for the use of renewable energy across the European Union by 2030 to be 32% and was complimented for bringing stability and predictability into the turbulent operational environment in the biofuel sector. RED II enabled the use of forest-biomass in biofuel production, provided that the material is sourced, and forests are managed according to sustainable principles. The guiding principle is that the emissions of sourcing and production of biofuels are lower than the default values (RED II Directive 2018/2001). The period between RED I and the very recent RED II was marked by turbulence and rapid developments in biofuel policies and intense public discussions of future developments and different scenarios.

Bioenergy and biofuel policies are very much tied in their national contexts (Lindstadt et al., 2015). Forests are extremely important for Finland - Finland is among the most forested areas in the European Union - and forests have not only economic and environmental, but also important symbolic value for Finns. Bioenergy, especially derived from forest biomass, has a central role in the Finnish energy matrix (Lindstad et al., 2015). At the same time, debates on to what extent forest biomass can be utilized in biofuel production without compromising natural values and being able to maintain forests as important

carbon sinks are on-going (Romppanen, 2017). Land use, which is regulated through LULUCF and represents the third pillar of the EU Climate and Energy Framework (Regulation on Land Use, Land Use Change and Forestry), is thus among the heavily debated topics in public discussions on biofuel policies. In particular, “the large-scale production of liquid biofuels from forest-based biomass may become limited by the availability of suitable raw material, and may have negative implications for the carbon sink, while the large-scale use of crop-based raw materials risks competing with food production” (Pääkkönen et al., 2019).

Polarization between environmental and economic values in the policy-making is evident in the current media discussions. There is much uncertainty, debates, and speculation on emission default and forest reference levels, and whether the levels should be set by the European Union or the member states themselves (Romppanen, 2017). Thus, the transition from the use of fossil fuels into utilizing renewable energy sources faces the need for policy cohesion because the comprehensive targets and respective policy instruments for bio-economy and circular economy are not well-defined and aligned in Finland (Pääkkönen, et al., 2019).

2.2 Public perceptions and stakeholder views of biofuels

2.2.1 Public perceptions and media coverage

The concept of public perceptions comprises questions such as: (1) citizens' participatory competence in influencing public policies and energy choices; (2) citizens' awareness about the current state of climate science, and the public trust in the national and supranational regulation; and (3) citizens' personal experiences and preferences about the complexity of climate change and the future environmental, economic, and societal needs. For instance, the European Social Survey 2016 (<http://www.europeansocialsurvey.org>) measured citizens' attitudes, preferences, expectations, opinions, beliefs, and values regarding climate change, and forms a comprehensive account of what are public perceptions in a given society. Finally, the public trust in climate actions by different social institutions, such as business corporations, governmental and non-governmental actors, municipalities, universities, and the media, reveals the current state of public perceptions in relation to the importance of bioenergy and biofuels

Mass media has an important role in presenting policy conflicts for public consideration (Lee et al., 2008), and environmental campaigning relies on media coverage (Hammond, 2018). Media coverage is vital, because resulting public awareness and perceptions influence policy outcomes (Govinda &

Hasanagic, 2018; Repo et al., 2018), and the case of biofuels is no different, as media coverage influences public opinion (Lyytimäki et al., 2018).

The current research literature suggests that the interrelations between public perceptions and the media are complex, and the relationships between causes and effects will be difficult to predict and estimate. Hammond (2018) discusses the role of media on the one as a communicator, and on the other as an influencer to understand the way in which policies are covered, often following the internal logic and dynamics of competitive media environments. According to Lee et al. (2008) in the framing of policy debates, issue dualism – representing two opposing polarized views – is part of typical journalistic practice and used in maintaining the aura of objectivity of journalistic practice, but the practice has received critique for its tendency to deepen the debates and erode public trust.

Stakeholder perceptions or views represent the interests of those that are at stake. According to Pestalozzi, Bieling, Scheer, and Kropp (2019), stakeholders relates “to those who are representatives of any social group and organisation relevant to a specific activity, are influenced by this activity, take part in the decision-making around it, and directly responsible for its management, or to have impact or pre-eminence on the collective opinion”. Pestalozzi et al. (2019) studied views of expert stakeholders from industry, politics, and associations in Germany. According to them, “expert stakeholders from science and industry showed confidence in the public’s acceptance of biogas and integrated power-to-biogas (PtG) chain once adequate information has been communicated”. Views of the Finnish expert stakeholders in the EU biofuel sustainability policy were studied by Kangas, Lyytimäki, Saarela, and Primmer (2018) who noticed that “climate impacts dominate the media discussion while other sustainability dimensions are covered in expert discussion”.

Linking advanced biofuels policies with stakeholder interests, Schillo, Isabelle, and Shakiba (2017) found that “policy plays an important role in the commercialization and widespread acceptance of biofuels”. Using the example of advanced biofuels, they suggest to involve multiple stakeholder views in biofuels policies because “policies impact the different stakeholder groups differentially, and that such impacts manifest differently in different jurisdictions”.

2.2.2 Frame theory

“Frame”, according to the definition by Lee et al., (2008) is “a particular logic or organizing principle with which a given policy conflict is described in media reports, suggesting particular themes, interpretations, and terms by which such conflict should be understood”. In simple terms, frames influence the choices individuals make when processing information, and thus framing is a part of the

reasoning process in which citizens form political opinions (Lee et al., 2008). Therefore, frames guide the way the public processes information flow in media (Kim, Besley, Oh, & Kim, 2014).

Researchers such as Vliegenthart and Van Zoonen (2011) found ways to distinguish between framing and frames. The authors reviewed framing research literature and concluded that research on frame building typically portrays the process and the ways in which news are socially constructed and bound to the realities of the media world and journalistic practices, much as described above. A definition of framing or frame building has been provided by Vliegenthart and Van Zoonen (2011) as follows, saying “to frame is to select some aspects of a perceived reality and make them more salient in communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation.” However, conceptualizing frames has not been consistent among researchers since in some content analysis studies the differentiation between themes, frames or story topics does not exist (Borah, 2011). Borah also emphasizes that conceptualizations partially overlap with other research streams such as priming and agenda setting.

Another stream of framing research exhibits interest in frame effects, so the ways in which frames have resonance in public discussion and opinion outcomes. Frame effects is a phenomenon that is mortifying in public opinion research because changes in the declaration of a subject can lead to changes of opinion (Chong & Druckman 2007). Vliegenthart & Van Zoonen (2011) note that “experiential knowledge and popular wisdom take precedence over media discourse”. Frames can be contradictory, oppositional and contested; they are the result of socially situated articulations, and often produced in routinized processes (Vliegenthart & Van Zoonen, 2011). Notable in this case is that framing in media, according to Vliegenthart & Van Zoonen (2011), is only one component that forms public perceptions, and not necessarily the definitive one. Lee et al. (2008) note that these effects may be very subtle and not pronounced, which has resulted in indifference towards framing research, also noted by Carragee and Roefs (2004). They state that although several studies have investigated media frames, there is a considerable lack of examination of the multiple social factors, including organizations, politicians, and social movements who create these frames. Therefore, the fundamental presumption of the theory of frame is “that an issue can be viewed from a variety of perspectives and be construed as having implications for multiple values or considerations (Chong & Druckman 2007).”

The nature of framing research as a research stream is eclectic. For instance, Borah (2011) has noted that some scholars are in favour of studying a consistent set of frames and some have a high tendency to generate a unique set of frames for every study due to the different nature of every study. Lee et al. (2008) differentiated 5 issue-specific and generic frames, and categorised different generic frames employed by journalist when covering policies in media.

- (1) Strategy frames, which organises policy conflicts as a clash of competing political strategies, emphasise tactics and “winning and losing”.
- (2) Value frames connect debates with value-choices and moral principles and dilemmas connected with the debates (e.g. sustainability versus economic values). Debates are featured as “legitimacy contests”.
- (3) Material frames connect debates with economic consequences.
- (4) Issue frames focus on rationales.
- (5) Conflict frames, where the focus is on polarizations and debates. These different archetypes guide interpretation of media messages.

Delshad and Raymond (2013) observed local differences in the prevalence of positive and negative frames and noted that in the areas where biofuel production comprised a more significant part of the local economy, perceptions were more positive. The local differences of biofuel production show that it may be too expensive for some countries and thus seen as a negative frame, whereas costs might not play as large a part and production be seen as positive in other countries. The context in which frames have been investigated and researched are vital. Context has been noted to shape frames, as they are situated and socially constructed (Vliegenthart & Van Zoonen, 2011).

According to Vliegenthart and Van Zoonen (2011), current research suggests that there are differences in the media frames in national level. These differences, according to the authors, may be attributed to a wide array of reasons, including differences in media systems, differences in political systems, cross-national structural differences (structure of the national economy and institutions, for example), source differences (for example, in some nation states government may be more involved with the media), and some studies have focused more on the relative agenda-building power of different actors. For example, Lindstad et al. (2011) noted significant thematic differences in bioenergy policies in five different European countries. Thus, while these generic frames may occur throughout wider geographies, their local prevalence may vary.

2.3 Research question

Based on the previous scientific and practical premises, we have defined the following research question for our case study:

How do key stakeholders employ different frames in debates on EU biofuel policies in Finland?

3 METHODS AND ANALYSIS

3.1 Stakeholder identification and data collection

Stakeholders in biofuel policy debates in Finland were identified from the following six categories: corporations, governmental actors, non-governmental organizations (NGOs), municipalities, universities, and the media. Stakeholders were selected by using power-interest grid and influence diagram mapping (Bryson, 2004). Stakeholders are presented in Table 1.

Table 1. Stakeholders in biofuel policy debates

Corporations	Governmental actors	NGOs	Municipalities	Universities	Media
ST1, Neste, UPM, Kaidi	Ministry of Agriculture and Forestry, VTT, Ministry of Economic Affairs and Employment, Finnish Transportation Agency	WWF, Greenpeace, Autoliitto, MTK, Bioenergia ry, SLL, Finnish Nature Protection Agency	Helsinki Tampere Kuopio Jyväskylä	Tampere University, University of Helsinki, University of Lappeenranta	YLE Helsingin Sanomat Aamulehti Maaseudun Tulevaisuus Kauppalehti Tekniikka ja Talous

After identifying key representatives of the aforementioned stakeholder groups, articles were chosen from the stakeholder and mainstream media channels and websites using the keywords: biofuels, frames, public perceptions, European Union, public policy. The analysis period was 2010-2019 (period which marked policy transition RED I to RED II and developments in European Union's CARE packages).

Based on the stakeholder approach, the selected 59 relevant online publications including articles, press releases, statements, editorials, and other releases (Appendix A) were examined through the research method of frame analysis.

3.2 Frame analysis

Our research method was frame analysis. We selected opposing frames identified in the explorative study by Delshad and Raymond (2013) and adapted the frames for the purposes of our study. We adopted environmental cost and environmental benefit frame and economic cost and economic benefit frames directly from Delshad and Raymond (2013) study and included additional technological challenges and technological opportunities frames. Frames and their descriptions are represented in Table 2.

Table 2. Description of frames

Frame	Description
Environmental costs (negative)	Discusses potential environmental problems caused by biofuels production or use, including increased smog, water pollution, soil erosion, decreased conservation land, harm to animals on lands, deforestation and other harmful land-use changes, and increased or unchanged greenhouse gas emissions.
Environmental benefits (positive)	Focuses on potential environmental benefits derived from biofuel production/use. These include general references to biofuel as “cleaner burning fuel,” as well as the alleviation of specific problems such as urban air pollution, and global warming.
Economic costs (negative)	Connects biofuels to increased consumer costs, negative impacts to regional economic development and negative impacts to the national economy.
Economic benefits (positive)	Connects ethanol to decrease consumer costs—particularly fuel/energy cost, positive impacts to regional economic development and positive impacts to the national economy.
Technological challenges (negative)	Discusses potential technological problems caused by biofuels production or use.
Technological opportunities (positive)	Focuses on potential technological opportunities of biofuel production/use.

We used colour-coding in the analysis and coded all 59 publications. We recognised that the frames were unexhaustive and single publications could contain more than one frame. The data could also contain clear frames that were not included in our categorisations.

After the coding process of the frames is done, we will present the percentages of all the particular frames out of the total number of recognized frames. Also, percentages for negative and positive frames overall in articles using at least one negative or positive frame will be presented. Thus, we will see which frames are most prevalent in the concurrent media discourse on biofuels.

3.3 Research ethics

A case study of public perceptions and media framing focusing on biofuels highlights the meaning of trustworthy knowledge. We identify that the public discussion on climate change and global warming is a contested issue consisting of differentiated and competing stakeholder interests and public perceptions. We trust in the scientific knowledge to strive for globally sustainable solutions for the ecological, environmental, economic and societal questions on climate change and sustainable development. Therefore, we are interested to study how the media and other relevant stakeholders appreciate the current scientific evidence about climate change and the resultant public perceptions about biofuels as a sustainable energy solution in particular in road traffic.

We recognize that our case study is ethically sound if we critically judge our research findings both as citizens and researchers. Understanding how public perceptions are shaped, we emphasise the social and ethical responsibility of stakeholders, to seeing "stakeholders as citizens" (Crane, Matten, & Moon, 2004, p. 110). In our study, the participation of citizens and other stakeholders is indirect by nature and, therefore, the requirement for ethical approval rests on the quality and trustworthiness of our data.

To analyse our data consistently, we highlight integrity in biofuel policies. These policies should strive for the real net reduction of greenhouse gas emissions, not only to fulfill national emissions targets.

4 RESULTS AND DISCUSSION

4.1 Issue dualism and competing frames

The frames, as we have defined above, are looked at through the view of issue dualism to bring out a varied view of the debates on the EU legislation of biofuel. For each frame, there is a positive and negative view that we are exploring. As an example, in the environmental frame, on the positive side, the frame is based on emphasizing positive attitudes and advantages of using biofuels to combat climate change. For the environmental negative, we looked at arguments that portray the aspects of biofuels that are damaging to the environment, increasing pollution or being bad for forests.

4.1.1 Environmental frames

This section explores the frames which underline positive or negative environmental effects in transition from fossil energy to renewable energy such as the use of biofuels in transport. In Finland, renewable biofuels in road transport are considered a reasonable solution to reducing the negative environmental effects of fossil fuels without requiring high-cost investments in new automobiles and the distribution systems of fuels.

The second-generation biofuels pollute less and do not compete with crops in relation to the food production. Increasing the use of biofuels is also economically and socially one of the most advantageous ways to reach the EU emissions standards outside of the emissions trading system (ETS). Finland is committed to halve transport greenhouse gas emissions by 2030 in line with the Paris Climate Agreement, the National Climate and Energy Strategy, and the EU requirements. In this, the share of biofuels in road transport would increase to as high as 40% in 2030.

In the collected articles we analyzed, the positive environmental effects of biofuels were mentioned twice more than the negative environmental effects of biofuels. All in all, the positive environmental effects of biofuels were discussed 23 times in comparison to 11 times of the negative environmental aspects. This data shows that biofuels are considered more friendly for the environment rather than their negative aspects. From the stakeholder perspective, we found out that the main Finnish companies such

as Neste, UPM and ST1 have not even once reflected on the negative environmental effects of biofuels in the media.

Furthermore, according to our analysis, the interests of business corporations, governmental organisations, municipalities and non-governmental organisations emerged in environmental frames more as shared than contrary. Frames of the positive environmental effects of biofuels encompassed multiple objectives in relation to climate change and the UN sustainable development goals. Most of these frames highlighted the importance of technological advances to resolve the current and future environmental concerns.

Critical statements in the frames of environmental effects manifested national interests in relation to the Finnish economy and the forest industry. In particular, the LULUCF legislation has been widely criticized in the Finnish media. Finnish universities and the state's research institution VTT have questioned a new method of calculating the capacity of forests to act as a carbon sink. The framing of negative environmental effects as a consequence of the LULUCF regulation reveals the uncertainty among different stakeholders. According to our data, a growing uncertainty stems from two interrelated objectives. First, how to implement national obligations to cut greenhouse gas emissions according to the EU emissions trading system, and secondly, how to develop the responsible national production of biofuels.

4.1.2 Economic frames

This section overviews issue dualism of the economic frames that we identified. Economic benefits framing focuses on positive economic impacts of biofuels to individual consumers, businesses, regional development, and ultimately to the national economy. The economic negative frame focuses on increased costs to individual consumers and businesses, negative impacts to regional economic development, and disturbance to the national economic system. These frames speculate on the economic impacts of EU policies. In the articles we reviewed for this case study, both frames were present. Economic frames portray biofuel policies often on purely material dimensions through their perceived impact on micro-, meso-, and macroeconomic levels. They work through building different scenarios, which are presented either as threats or opportunities.

Economic positive framing focused on positive impacts on employment and national economy. Stakeholders employing this framing emphasised biofuels role as a new business field, as well as trickle-down effects on surrounding areas and businesses:

“Biofuel manufacturing has created nearly two thousand new permanent positions in Finland.” ... “Real impact on employment due to biofuels is even bigger for example because of the construction work of new bio-distilleries” (Aamulehti, 24.2.2019, translated from Finnish).

The economic benefit frame presents biofuels as a collective opportunity, where society benefits as a whole. Economic benefit frame presents biofuels as a sustainable solution that does not require costly investments on new electric infrastructure. The costs of biofuels are often contrasted with the costs for setting up new infrastructure for electric vehicles, and biofuels are presented as a cheaper, consumer-friendlier, and more readily-available solution for emission reductions.

“Renewable biofuels and plywood offer solid solutions for green transport – without requiring costly investment in new cars or fuel distribution systems” (UPM 10.8.2019).

Businesses and forest industry associations strongly emphasized economic positive framing, focusing especially on taxation issues and steering mechanisms, and the market-driven attractiveness of biofuels, but especially emphasizing benefits for the Finnish national economy. European Union Renewable Energy Directive (RED II) framing by the stakeholders in the forest-industry focused on positive outlooks to regional development and national economy, as the directive enabled the use of forest-based biomass as a raw material in biofuel production. According to the industry stakeholders, directive improved predictability of the operations environment, which was perceived to enable investments in bio-based innovations and R&D and further accelerate positive economic development. The EU policies were presented in a favourable way and commended for providing stability to biofuel markets.

“The decision by EU bodies creates stability to the operations environment of the Finnish businesses and enables new development. Investment calculations now have more solid grounds than before. Each company will have to orientate themselves to the details of this very broad policy” (MT 15.06.2018, translated from Finnish).

Prior to the directive RED II coming to force in 2018, industry bodies expressed strong opinions on how especially the forest industry should be treated when drafting policies. Industry bodies emphasized particularly the role of biofuels as export products and increasing domestic and international demand:

“If Finland has more ambitious goals than other EU-countries, [according to Koponen] the Union should aid Finnish businesses and treat wood use propitiously” (Kauppalehti, 17.03.2016, translated from Finnish).

“Ilmasto ei näillä pelastu, mutta pykälät täyttyvät” – Kestävistä biopolttoaineista tulee kova pula, mutta tehtaita on rakenteilla vasta kourallinen” (Aamulehti 24.2.2019)

While the economic benefits frame commends the certainty and stability created by new policy developments, a central theme in economic costs frame is uncertainty: on the one hand, the uncertainty of the calculations, estimations, and scenarios, and other grounds of the policy-making, and on the other

hand, the remaining uncertainty of the operational environment in which different bodies make big decisions about the future:

“It is sad that the industrial policy around bioeconomy in Finland is based on weakly justified assumptions, that will break sooner or later. Respectively, the profitability of the planned investments is endangered” (WWF, 4.5.2016).

Framing efforts around negative economic impacts were also focused on increased costs to individual consumers, businesses and municipal communities and investments needed to achieve the transformation to bio-based fuels. Stakeholders leaning on this frame expressed their concerns on overly environmentally ambitious policies that could potentially have destructive impacts on communities and businesses especially in the rural areas, where distances are long and alternative transportation methods are not readily available. The economic negative frame underlined controlled and gradual transformation and emphasized the current dependence on fossil fuels:

“MTK perceives it is extremely important that the measures taken for reduction of emissions are not targeted disproportionately and will not stress businesses in rural areas and areas of dispersed settlement. In the land of long distances fully emission-free traffic infrastructure is extremely difficult to achieve” (The Central Union of Agricultural Producers and Forest Owners, MTK), 13.4.2017).

“It has to be acknowledged that the heavy-duty traffic will be powered mainly by diesel engines still for a long time” (The Central Union of Agricultural Producers and Forest Owners (MTK), 13.4.2017).

4.1.3 Technological frames

“The development of biofuels is questionable when set to an energy economic perspective. The further a biofuel is refined, the more energy is required” (Aamulehti 24.2.2019, translated from Finnish)

Beginning with the negative side, the main causes of negative framing were downplaying the advancements made in biofuel production and technology, stating that the technological development was made just to satisfy regulations and that the regulations themselves were in the wrong. As in the above example, ST1, a stakeholder on the distributor side, viewed the development of biofuels and biofuel production facilities as a negative, stating that it will not help to solve any crisis, but will satisfy the requirements set. A sentiment that can be further seen in the quote below highlighting the frustration that they expressed towards the building of biofuel production facilities.

“By this he means that new production facilities will fill the goals set out by the EU and Finland to have more biofuels hold a larger share in the fuel used in traffic, but in terms of stopping climate change, the legislation has only a marginal impact” (Aamulehti 24.2.2019, translated from Finnish).

Another negative view on the technological development was set out by VTT's Nils-Olof Nylund, who goes to state that the efficiency and updating our car fleet to newer, more efficient cars is a much more important point to make rather than seeing a shift to biofuel. Here the technology was framed as a negative by providing an alternative to shift to, and seeing that the development of biofuels was wasted resources that could better be spent elsewhere. ST1 also continues along this line, stating that a move to more biofuels would simply not be feasible with the current car fleet in Finland, noting especially the technological challenges of acquiring suitable diesel biofuel for winter conditions in Finland (Yle, 27.8.2018).

When viewing the different stakeholders interested in portraying the EU legislation as a negative, we can clearly see that the major player actively portraying the development of biofuel technology as a negative is ST1. This role is likely due to them not being as far along in developing biofuels or biofuel production capacity as Neste, a major competitor, is, and thus wanting to downplay the technological advancement of biofuels as an option. By portraying the EU legislations behind biofuel as unneeded and wasteful, they hope to affect public perception to view a shift to biofuels as unnecessary. From the side of VTT, Nylund seems most interested in developing the car fleet of Finland, and his opinion is that the necessary changes should be made in cars, not fuels, downplaying the fuel aspect to emphasize cars, his area of expertise.

The conclusion that can be drawn from the analysis of the negative framing of technological advancement is that the stakeholders framing biofuel development have a vested interest in promoting other alternative solutions, thus downplaying the role of technology relating to biofuel, emphasizing the costs associated and the alternatives present. Here the backdrop of EU legislation is portrayed in a negative manner, as unneeded and a bad solution.

“When car usage is lessened with the changing practices in traffic, the breakthrough of electric and biofuel powered cars will leave fossil fuels as a thing of the past.” (Nielut ylös ja päästöt alas: Näin Suomesta saadaan ilmastoa viilentävä maa vuoteen 2030 mennessä Luonnonsuojelija 27.2.2019, translated from Finnish)

For the positive side of the technological debate, there are some main points that pop up in the data multiple times. In this frame stakeholders generally view the impact of EU legislation as a positive, especially regarding the legislation set out to further the use of biofuels. The stakeholders in this frame tend to emphasize the achievements of the technology that they have and the opportunities the technological advancements create. One of the key aspects of technological positives that has been emphasized across a range of shareholders is how investments in biofuel will help combat emissions and how clean new technology is.

“Significant emission reductions can be obtained with renewable fuels, where Finland is at the forefront.” (UPM, 10.18.2019)

Another key stakeholder eager to emphasize the technological developments of biofuels is Neste, stating how their new biodiesels will help decarbonize flights.

Vanacker’s vision is clear: aviation firms will need Neste’s help to reach their goal. (Yle, 6.2.2019, translated from Finnish)

These sorts of statements give a glimpse of companies attempting to promote their own product as a solution for fulfilling the legislation set out by the EU. Here the companies are showing how the technological development that they have done has enabled them to offer a cleaner alternative, or at least one that fits the EU legislation and thus framing the discussion of EU legislation as their companies coming to fulfill the technological gap and providing a solution for the challenges presented in fulfilling regulation.

“In the future, biofuels will be produced from the leftover material from logging. The term used is advanced biofuels in order to distinguish them from biofuels made from edible plants.” (Helsingin Sanomat, 4.7.2017).

Another technological aspect that gets emphasized is the sourcing of fuel. The framing seems to emphasize the potential of the new biofuels in how they source raw material, especially important considering that the role of palm oil in the sourcing of biofuels has drawn heat in the Nordic countries, with Norway and Sweden disputing the cleanliness of Neste biofuels (Yle, 9.10.2019). Here we again see the emphasis of technological advances in biofuels as producing a solution, noting that in the Finnish context the emphasis on logging by-products is especially important due to the importance of the forest industry.

In general, the technologically positive category is composed of the different stakeholders seeing biofuels as a way to fulfil the EU legislations. Biofuels are framed as environmentally positive, and the EU legislation is mentioned as a backdrop to why these have been developed. What is emphasized is often the development that has been made in the field of biofuel research and how the biofuel developed by that specific stakeholder helps meet the targets set out by the EU. In the technologically positive framing, the EU legislation is not questioned, as the stakeholders have an interest in promoting the use of biofuels, either seeing them as reducing emissions or having a business interest in them.

4.1.4 Summary of frames

Within all the frames of environmental, economic, and technology, environmental friendly aspects of biofuel are placed as of top importance in the articles analyzed. What has been noticed are the positive attitudes of major Finnish companies in relation to producing biofuels to adopt not only the EU rules, but also the Finnish domestic rules, without any resistance.

Using the colouring method, in 59 articles we found in total 226 observations which will be divided into six frame categories and six stakeholder groups as the following Figure 1 shows.

Figure 1. Frame categories and stakeholder groups

As the figure shows, environmental, economic, and technological positive notions about biofuels among stakeholders are divided into coherent parts in relation to observations we coded by colours for our analysis. On the other hand, negative notions do not appear an equally logical sequence compared with positive notions. In particular, the media expresses stronger perceptions about economic and technological negative effects than other stakeholders. As an exception to the general picture, corporations highlight the environmental negative effects of biofuels more than what the other stakeholder groups indicate.

4.2 Frame interconnectedness

This chapter contributes to the findings discovered in the issue dualism and competing frames part through a content analysis of the most common frame combinations used by stakeholders, presented in the table of the most frequent correlations.

Methodologically, first, the color coding of six frames was implemented in each article. Second, the frames that are closely situated to each other were counted once per article. Third, the total number of frame correlations was divided by the number of identified frames in order to get the average number of frame correlations per category and if the number of correlations was equal to, or exceeded the average value, the category was included in the table. Finally, the conclusions were derived.

Table 3. The Most Frequent Correlations

Frame Correlations	%
Environmental Positive & Economic Positive	38 %
Environmental Positive & Environmental Negative	23 %
Economic Positive & Technology Positive	15 %
Economic Positive & Economic Negative	11 %
Technology Negative & Technology Positive	11%

Environmental Positive & Economic Positive

The connection of environmental and economic positive frames is the most frequent (38%). According to the analyzed articles, there are many informed reasons for this connection. For instance, municipalities and transport companies are strongly committed to invest in greener options of public transportation so that “buses running on biogas and electricity are slowly becoming a more common sight in Finland” (YLE, 10.07.2019). Public awareness of economically, socially, and environmentally harmful fossil fuel subsidies has increased remarkably in Finland. NGO FANC (27.2.2019) claims that “removing harmful subsidies from the energy and transport sectors will make it possible to reduce emissions and make sustainable investments”. The Neste corporation (13.11.2018) underlines the importance of the EU’s role

as a serious decisive power in climate change, the actions of which allows to predict the future operating environment.

Environmental Positive & Environmental Negative

This correlation points out the main causes of carbon dioxide emissions such as transportation, meat production, logging, peat, overpopulation and waste. It shows Finland as an active climate change mitigator, aligned with the Paris Climate Agreement aims. Biofuel is not referred to actively, instead, removing the subsidy streams from fossil fuels is seen as the main solution towards using more renewables (UPM,10.08.2019); (FANC,13.11.2018).

Economic Positive & Technological Positive

In these frames the main discussion is the mitigation of emissions through the development of technologies, where innovation of biofuel technologies was had the main role and was portrayed as a positive alternative. As in the previous categories, economic concerns are most evident and include: competitiveness of biofuels, local refinery capacity, export, investments, and the forest industry. The EU's policies in this debate was looked upon from the perspective of influence on the economy: "Generally speaking, the impact of the action package appears to remain moderate with regard to the national economy, if the goals set for Finland can be achieved primarily through the increased use of biofuels" (VTT, 27.05.2014).

Technological Negative & Technological positive

The debate concerns the role of biofuel in the transport industry. The electrical alternative is compared to the bio, but the drawn picture does not reveal which alternative is better and rather shows that both technologies are equally good in questions of the emission mitigation for passenger and heavy duty vehicles, and the life span of public transport. The EU's role is indicative and the policies allow companies to start investing into the development of second-generation biofuels (YLE, 10.07.2019).

Environmental Positive & Technological Positive

The correlations illustrate how companies demonstrate their commitment towards emission mitigation agenda through the development of biofuel technologies and aggressive attacking on fossil fuels: "It's about banning fossil fuels or making them too expensive. Fossil fuels are over and must be replaced by renewable fuels" (Kauppalehti, 17.3.2016).

To sum up, the frame interconnectedness analysis revealed that Finnish stakeholders are ready to mitigate the emissions by switching to biofuels. However, to achieve this, the EU and Finnish bioenergy

policies must be more aggressive towards fossil fuels to ensure the profitability of biofuel and therefore to encourage the required investments. To further clarify which key stakeholders were connected to which frames, please see figure 2 below.

Figure 2. Stakeholders and key frames

5 CONCLUSIONS

Forecasting the emissions and drafting policies that enhance the European Council's targets for 2030 raises many complex questions. In this study, we focused on one set of legislation that the European Union introduced to reduce emissions, namely by increasing the use of biofuels. Against this background, we identified and analysed the key stakeholders of biofuels in Finland to understand how they participate in framing the public discussion on biofuels.

Conclusions of our study indicate that biofuels are portrayed for the most part positively. Stakeholders expect the EU legislation of biofuels to protect the environment by reducing emissions and to encourage to safely invest in biofuels and biofuel production, and that the legislation also enables the sustainable demand and distribution of biofuels. In particular, industry stakeholders see biofuels as a positive alternative referring to their advances in the production and development of biofuels.

On the negative side, the NGO's viewed discussion on biofuel solutions as a negative, citing concerns about land-use and miscalculations regarding the amount of emissions cut by switching to

biofuel solutions. The economic concerns were mostly on the part of increased costs for consumers, stating that a switch to biofuels would make driving more costly and negatively affect especially the rural population.

EU legislation is a large part of the discussion on biofuels in Finland, however it is often mentioned as background information on why the topic is being discussed. The legislation itself is not scrutinized extensively and the discussion focuses on the possibility of consequences of the legislation is instead the focus of the discussion. In particular, the EU voluntary schemes of biofuel production would be replaced with the international agreements. Promoting multi-sectoral contribution, the framework of Nationally Determined Contributions (NDCs) of the Paris Climate Agreement allows countries to simultaneously implement national priorities and global climate objectives (Buyx & Tait, 2011; Bhardwaj et al., 2019). For instance, the potential of biomethane production in replacing fossil fuels in the heavy-duty road transport is very high in Finland (Pääkkönen et al., 2019).

5.1 Limitations and recommendations

When taking into account the limitations of our research, it is crucial to note that the data pool is limited by the 59 articles, which vary in length and even though distributed rather equally some stakeholders' viewpoints could be presented more clearly. In some cases, the viewpoints of stakeholders came down to certain individuals interviewed in the articles, rather than as a representation of the whole organization.

Another limitation was the process of data colour coding which was based on the common rules established by the research group, but conducted individually, therefore becoming a result of subjective thinking.

For further research, we would suggest seeking out other frames in the articles, which do not fit to any of our six categories and therefore require additional attention. We also suggest to look into the cross-tabulation, which shows how each frame correlates with certain stakeholder unit, especially in the media channel in order to find which stakeholders use which media channels. Additionally, conducting a similar study using key stakeholders in a country other than Finland would be useful, as the forest industry shapes the discussion of biofuels in a significant way, and thus, for example, the role of biofuels competing for resources against the food sector is not present in the Finnish discussion.

Furthermore, the above study deals with the frames used by stakeholders to portray biofuel as to affect public perception rather than showing how these frames are actually influencing people and policy making. Interviews and perhaps some form of public survey, would be an interesting way to answer these questions.

Finally, there is no doubt that the issue of transition to biofuel is a wicked problem that demands cohesive communication among the interested parties, and it would be wise to further these communications between the various stakeholders on both the Finnish and EU level.

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Appendix A: Key stakeholders and related articles on biofuels

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3. [Biofuel legislation - What's the EU's next move?](#)
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Governmental actors:

Ministry of Agriculture and Forestry

7. [Biofuels and bioliquids](#)

VTT, research center owned by Finnish government

8. [Increase in the Use of Biofuels the Most Cost-Effective Way for Finland to Achieve the Goals of the EU's 2030 Climate and Energy Package](#)
9. [VTT and Deino to develop new methods for biofuel production](#)

Ministry of Economic Affairs and Employment of Finland

10. [Biofuels](#)

Finnish Transportation Agency

11. [Hiiletön liikenne 2045 – polkuja päästöttömään tulevaisuuteen](#)
12. [Finland sets new law to increase biofuel use in road traffic](#)

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WWF, Finland, Environmental Agency

13. [EU:n bio-polt-toai-nei-den kes-tä-vyysk-ri-tee-ris-tö askel oikeaan suuntaan](#)
14. [WWF:n laskelma: hallituksen bio-ener-gia-ta-voit-teet epä-rea-lis-ti-sia](#)

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15. [Nielut ylös ja päästöt alas: Näin Suomesta saadaan ilmastoa viilentävä maa vuoteen 2030 mennessä](#)

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16. [Lausunto parlamentaarille työryhmälle liikenteen päästöjen vähentämisestä 2030 mennessä](#)

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17. [Autoliiton lausunto biopolttoaineiden käytön edistämisestä](#)
18. [Autoliiton lausunto liikenteen päästövähennyksistä](#)

Bioenergia ry, The Bioenergy Association of Finland – Natural energy from Finland

19. [Biopolttoaineiden käytön lisääminen edullisin tapa saavuttaa EU:n ilmasto- ja energiapaketin tavoitteet](#)

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23. [Sustainable Tampere 2030](#) (Esa)
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31. [Autoilija ei voi tietää, paljonko biopolttoaine vaikuttaa ympäristöön – bio-osuus vaihtelee dramaattisesti, ja se näkyy selvästi liikenteen päästöissä](#)
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33. [Neste kaavailee uusiutuvalle lentopolttoaineelleen isoa roolia: yhtiö aikoo kymmenkertaistaa sen tuotannon](#)

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35. [Opinion on shifting car fleet to electric/biofuels](#)
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43. [Finland to shift biofuel and electric vehicle usage into high gear](#)
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50. [EU muutti uusiutuvien polttoaineiden laskutapaa, jotta ympäristötavoitteista ei tarvitse tinkiä \(biofuel goals set by the EU\)](#)
51. [Selvitys: Liikenteen biopolttoaineet tehdään valtaosin ulkomaisista raaka-aineista vielä 2030 – sähköautoinnokkuus vaikuttaa hintaan \(biofuel production\)](#)

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53. [Positive notes on biofuel support](#)

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54. [Suomi kirii biopolttoaineiden mahdiksi](#)

Tekniikka ja talous

55. [Paljonko biopolttoaineet voivat vähentää lentoliikenteen päästöjä](#)