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Screening potential social impacts of fossil fuels and biofuels for vehicles

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HIGHLIGHTS

- Both fossil and biofuels displayed high or very high risks of negative social impacts.
- Social procurement requirements should be applied on all vehicle fuels.
- Applying social criteria only on biofuels may be unfairly benefiting fossil fuels.
- Social LCA can identify severe social impacts and influence policies accordingly.
- Schemes can be adapted to include relevant criteria for specific fuels and/or origins.

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ABSTRACT

The generic social and socioeconomic impacts of various biofuels and fossil fuels were screened by applying Social Life Cycle Assessment methodology. Data were taken from the Social Hotspots Database on all categories for all the related themes and all indicators available. To limit the amount of data, only high and very high risk indicators were considered for each combination. The risks identified per life cycle phase were listed for each fuel assessed and the results were then aggregated by counting the number of high and very high risk indicators for that fuel.

All the fossil fuels and biofuels analysed were found to display high or very high risks of negative impacts. Country of origin seemed to be of greater importance for risks than fuel type, as the most risk-related and least risk-related product systems referred to the same type of fuel, fossil oil from Russia/Nigeria and fossil oil from Norway, respectively. These results suggest that in developing policy, strict procurement requirements on social performance should be set for both fossil fuel and biofuel. However, the results must be interpreted with care owing to some limitations in the assessment, such as simplifications to life cycles, method used and data collection.

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1. Introduction

The use of different types of fuels for the propulsion of vehicles has been thoroughly discussed during the past decade and the discussions continue. There is a desire in society to reduce the use of fossil fuels, manifested in the European Union (EU) goals for 2020 (European Commission, 2009). This has led to an extensive search for alternatives to fossil fuels, such as renewable options. The introduction of new technologies requires research to identify the potential benefits, as well as the potential risks. To cover all stages of production and use, a life cycle perspective is required. Since fuel production chains tend to be global, taking a life cycle approach means that all life cycle phases back to the country of origin must be studied.

Fuel production and use can lead to environmental, economic and social impacts. Most of the literature to date on vehicle fuels concentrates on the environmental impacts, mainly focusing on greenhouse gas emissions and discharges from fuel use. Recent reviews include those by Bessou et al. (2011) and McKone et al. (2011). Previous studies have mostly used a life cycle perspective in order to evaluate the total greenhouse gas performance of different biofuel chains.

The production and use of both fossil fuels and biofuels may have negative social impacts, but available research on the social

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Table 1
Degree of inclusion of socioeconomic aspects in existing biofuel certification schemes, standards and policies. "x" indicates inclusion (Hoglund et al., 2013).

Scheme[a]		RED	RSPO	RTRS	BSI	RTFO	NTA 8080	ISCC	RSB	CSBP	GBEP	US-RFS	LCFS
Socio-economic aspects	Economic develop-ment		x	x	x		x	x	x		x		x
	Social aspects	x	x	x	x	x	x	x	x		x		x
	Labour conditions		x	x	x	x	x	x	x	x	x		x

[a] RED=Renewable Energy Directive (2009/28/EC), RSPO=Roundtable of Sustainable Palm Oil, RTRS=Roundtable for Responsible Soy Production, BSI=Better Sugar Initiative, RTFO=Renewable Transportation Fuels Obligation, NTA 8080=Standard developed under the Cramer Commission (The Netherlands), ISCC=International Sustainability and Carbon Certification, RSB=Roundtable on Sustainable Biofuels, CSBP=Council on Sustainable Biomass Production, GBEP=Global Bioenergy Partnership, USRFS=United States Renewable Fuels Standard, LCFS=Low Carbon Fuel Standard.

aspects of fuel production and use is limited. However, in recent years the aspect of biofuel production concerning its impact on land use and food supply has gained some attention (Searchinger, et al., 2008). Social aspects have thereby become an issue for biofuels. Most of the biofuel policies and certification frameworks existing today include socioeconomic aspects in one way or another. This shows that social aspects are considered important for the sustainability of biofuels. Many existing schemes are linked to international agreements and conventions such as the ILO Convention and international policy frameworks such as the Renewable Energy Directive (2009/28/EC) as a minimum baseline. Table 1 shows the degree of inclusion of socioeconomic aspects in existing sustainability schemes. As can be seen, almost all schemes include criteria on social aspects.

In recent years, use of fossil fuels has also been questioned from a social and ethical point of view in terms of negative social impacts. However, a broad social assessment in a life cycle perspective of different types of vehicle fuels (both biofuels and fossil fuels) is still lacking.

Researchers in the field of Life Cycle Assessment (LCA), which has hitherto focused mainly on environmental aspects, have started to investigate the possibility of broadening their perspective to address also social and economic aspects. Guidelines for Social Life Cycle Assessment (S-LCA) were published in 2009 by the Life Cycle Initiative, a cooperation between United Nations Environment Programme (UNEP) and the Society of Environmental Toxicology and Chemistry (SETAC) (Benoît and Mazijn, 2009; Benoît-Norris et al., 2010). The method has since been tested in various case studies (e.g. Aparcana and Salhofer, 2013; Ciroth and Franze, 2011; Ekener-Petersen and Finnveden, 2013; Ekener-Petersen and Moberg, 2013; Franze and Ciroth, 2011; Norris et al., 2011). The results show that S-LCA offers the possibility to assess a broad range of social impacts in a systematic way with a life cycle approach, but also that further methodological development is required.

One area requiring development is access to data on social impacts. Lately, as a response to this requirement, an online tool for collection of social data, the Social Hotspot Database (SHDB), has been made available (Benoit-Norris et al., 2012). This tool is based on the above-mentioned UNEP/SETAC Guidelines, but the issues and indicators used are not fully the same.

The main objective of the present study was to use LCA methodology to carry out a screening assessment of the social and socioeconomic impacts of a selection of biofuels and fossil fuels, focusing on the identification of potential "hot-spots", i.e. aspects with a risk of significant social impacts. The assessment was performed on a generic level, i.e. with country and/or sector level data, allowing for identification of potential hot-spots but not of real social impacts. A second objective was to apply S-LCA methodology to vehicle fuels and evaluate the performance of the method in this context. The data used were taken from the recently launched SHDB, making it possible to also evaluate this database and identify possible improvements and refinements.

2. Material and methods

The study comprised a literature review and an S-LCA. The literature was reviewed in order to allow the results from the S-LCA to be compared against previous findings in the literature. Two workshops with invited stakeholders were also held in order to obtain input for the study.

2.1. Literature review

A systematic literature search was conducted for scientific papers and reports dealing with at least one social aspect associated with the production and use of vehicle fuels. In this search, terms such as 'fossil fuel', 'oil', 'petrol', 'biofuels', 'biodiesel', 'ethanol' were combined with the terms 'social' and 'social impact'. It should be noted that the literature search did not aim at capturing literature on the impacts of production and exportation of vehicle fuel on the general economic development of a country and its related social impacts. Thus, these impacts are not included in the assessment.

2.2. Workshops

Two workshops were arranged during the project. The stakeholders present at the two workshops represented a variety of sectors, such as producers of biofuels and fossil fuels, the industry association for vehicle fuels, the association for farmers, the municipality of Stockholm, representatives from state agencies such as the Swedish Energy Agency, industry experts, NGOs, and researchers. At the first workshop, the participants discussed which fuels should be included in the study and whether all relevant social categories were accounted for in the literature review. At the second workshop, the participants discussed the methodology used for the S-LCA, the conclusions that could be drawn and how to present the results.

2.3. Social life cycle assessment, S-LCA

Screening S-LCA is a technique that aims to assess the social aspects of products and services and their potential positive and negative impacts along their life cycle. This life cycle encompasses in principle extraction and processing of raw material, manufacturing, distribution, use, reuse, maintenance, recycling and final disposal (Benoît and Mazijn, 2009). S-LCA addresses potential social impacts, i.e. potential impacts on human beings and society. The proposed impact categories in the Guidelines for S-LCA issued by UNEP/SETAC (Benoît and Mazijn, 2009) are Human rights, Working conditions, Health and Safety, Cultural heritage, Governance and Socio-economic repercussions. The SHDB made available recently contains generic data for S-LCA hotspot assessment, i.e. a screening S-LCA (Benoit-Norris et al., 2012). In the present screening S-LCA, the SHDB was used as the data source and the social impacts included were those defined by that database. It is

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