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SOCIAL AND SOCIOECONOMIC IMPACTS FROM VEHICLE FUELS

Summary report from an f3 project

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THE SWEDISH KNOWLEDGE CENTRE FOR RENEWABLE TRANSPORTATION FUELS

PREFACE

This report summarizes a project that has been carried out with financial support from the Swedish Knowledge Centre for Renewable Transportation Fuels (f3). The f3 Centre is a nationwide centre, which through cooperation and a systems approach contributes to the development of sustainable fossil-free fuels for transportation. The centre is financed by the Swedish Energy Agency, the Region Västra Götaland and the f3 Partners, including universities, research institutes, and industry (see www.f3centre.se).

The project has been performed by Elisabeth Ekener Petersen and Göran Finnveden at the Division of Environmental Strategies Research, KTH, Royal Institute of Technology, and Jonas Höglund at IVL, Swedish Environmental Research Institute Ltd.

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The project has played a part in the following PhD Thesis:

Ekener-Petersen, E. (2013). *Tracking down Social Impacts of Products with Social Life Cycle Assessment*. (Doctoral dissertation). Stockholm: KTH Royal Institute of Technology.

INTRODUCTION

BACKGROUND

The issue of climate change impacts from fossil vehicle fuels has led to a search for renewable alternatives. 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 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 literature to date on vehicle fuels has its emphasis on the environmental impacts, mainly focusing on greenhouse gas emissions and discharges from fuel use. However, in recent years the aspect of biofuel production concerning its impact on land use and food supply has gained some attention (Searchinger 2008). 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, are investigating the possibility of broadening the perspective of LCA to include sustainability. Guidelines for Social Life Cycle Assessment (S-LCA) were published in 2009 by the Life Cycle Initiative, a co-operation between United Nations Environment Programme (UNEP) and the Society of Environmental Toxicology and Chemistry (SETAC) (Benoît and Mazijn 2009; Benoît, Norris et al. 2010). Lately, also an online tool for collection of social data, the Social Hotspot Database (SHDB), has been made available (Benoït-Norris et al. 2012).

AIM

The main aim of the 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 “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, to find the social hot-spots for each fuel. A second objective was to apply S-LCA method 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 evaluate this tool and identify possible improvements and refinements.

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. 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.

Two workshops were also arranged during the project. Relevant stakeholders, including industry experts, NGOs, researchers, fuel producers and representatives from state agencies, were invited to each workshop.

Social Life Cycle Assessment, S-LCA

S-LCA aims to assess the social aspects of products and services and their potential positive and negative impacts along their life cycle, i.e. extraction and processing of raw material, manufacturing, distribution, use, reuse, maintenance, recycling and final disposal (Benoit and Mazijn 2009). S-LCA addresses social impacts, i.e. impacts on human beings and society. The proposed impact categories in the Guidelines for S-LCA issued by UNEP/SETAC (Benoit and Mazijn 2009) are: Human rights, Working conditions, Health and Safety, Cultural heritage, Governance and Socio-economic repercussions. The Social Hotspots database (SHDB) made available recently contains generic data for S-LCA hotspot assessment, i.e. a screening S-LCA. The SHDB contains social data on country and sometimes on sector level. The data in the database are displayed as assessed level of risk (low, medium, high or very high) for each sector/country and indicator.

Selected fuels

Based on the literature review and stakeholder input in the workshop, diesel, petrol, biodiesel and ethanol were selected for inclusion in the study. The specific fossil fuels selected were diesel and petrol produced from imported crude oil from Russia, Norway and Nigeria. The specific biofuels selected were ethanol from Brazilian sugar cane, from French wheat and maize and from maize cultivated in the US, and rapeseed biodiesel originating from Lithuania. These fuels are either typical of the fuels used within the EU and Sweden, or interesting case studies in order to get a variety of fuels and countries.

The production chains were simplified and grouped into three main phases, i) production/cultivation, ii) refining/processing and iii) transport. These reflect the main phases of a generic production chain applicable to both biofuels and fossil fuels. A product system was defined for eight combinations of processes in different geographical locations (i.e. countries) and industry sectors (Table 1).

Table 1. Simplified product systems for the selected fuels.

Phase 1 Production/cultivation	Phase 2 Refining/transport	Phase 3 Transport
Russian Oil Production	Russian Refinery	Russian Transport
Norway Oil Production[1]	Norway Transport	Sweden Refinery
Nigeria Oil Production	Nigeria Refinery	Nigeria Transport
Brazil Sugarcane Production	Brazil Ethanol Processing	Brazil Transport
US Maize Cultivation	US Ethanol Processing	US Transport
France Maize Cultivation	France Ethanol Processing	France Transport
France Wheat Cultivation	France Ethanol Processing	France Transport
Lithuania Oilseed Cultivation	Lithuania Biodiesel Processing	Lithuania Transport

[1] Refined at the country of destination

Comparing the outcome of the literature review with the issues in the SHDB, we found that for stakeholder local community, ‘Access to arable land’, in the subcategory ‘Access to material resources’, was not covered in the SHDB. The same applies to ‘Access to immaterial resources’, where issues such as land rights are missing.

RESULTS

Since the aim in this study was to identify hot-spots, we only considered high and very high risk indicators. In order get an overview of the results, they were aggregated by counting the high and very high risk indicators for each product system. The outcome can be displayed in various graphs. The graph for the total number of risks for each product system is shown in Figure 1.

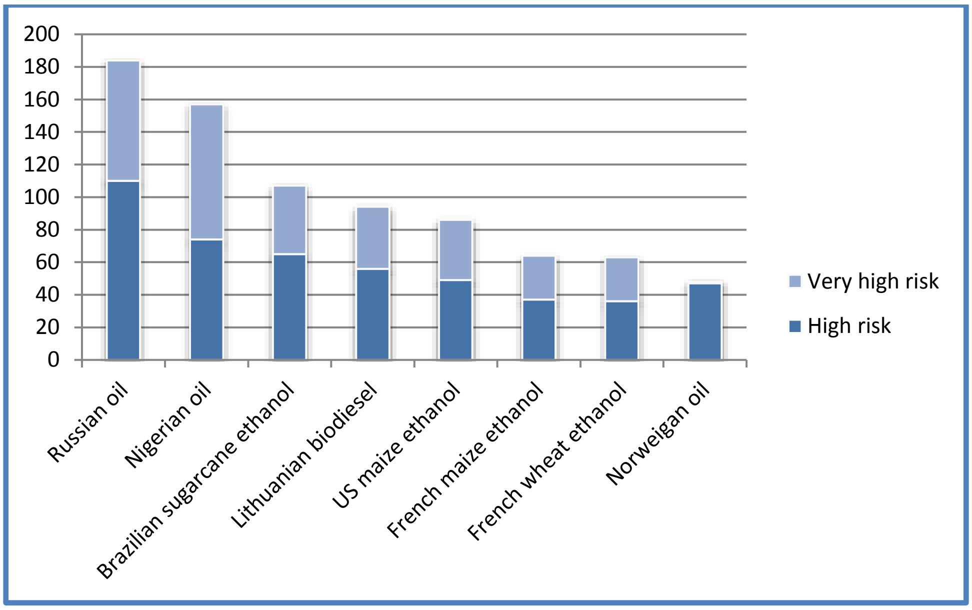

Figure 1. Total numbers of high and very high risks per product system.

From Figure 1, it can be seen that the number of risks varied widely between the different product systems analysed, from about 180 risks in total for Russian oil to about 40 risks for oil from Norway.

By splitting by social category and by phase for all product systems (Figure 2 andFigure 3), it was shown that labour issues, followed by human rights and health and safety, are the most risk-laden issues for vehicle fuels. Regarding the most impacting phase, all three production phases assessed appeared to be equally influential.

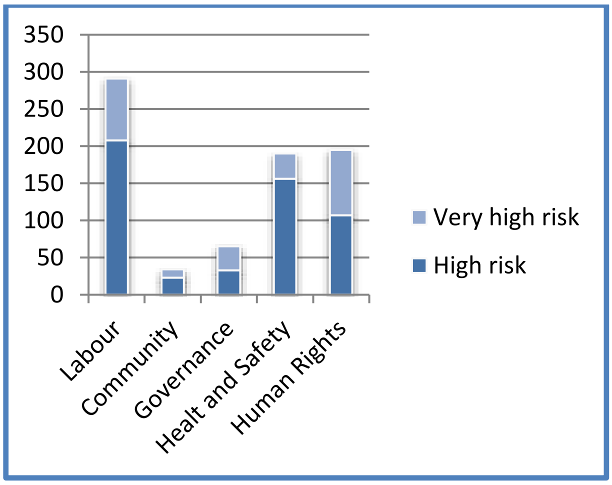

Figure 2. Total numbers of high and very high risks per social category.

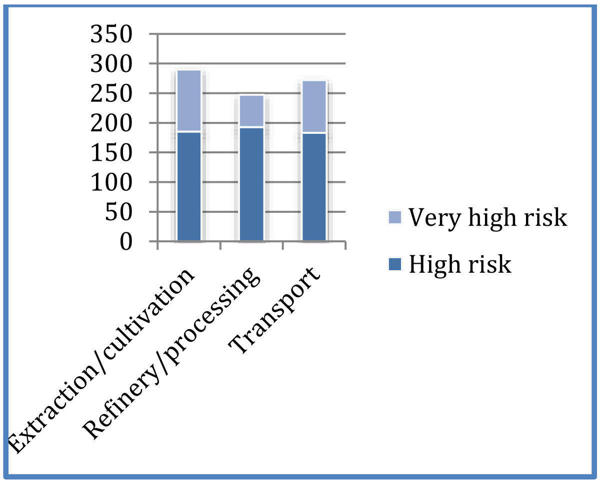

Figure 3. Total numbers of high and very high risks per production phase.

LIMITATIONS

The results must be interpreted with care due to the limitations in this study. One limitation is that the assessment only included a limited set of social impacts. Further, we treated all risks the same, i.e. without distinguishing whether one risk is worse than the other. In reality, some risks are likely to have more potentially severe impacts than others. As all the country/sector combinations were treated in the same way, we concluded that this was an acceptable simplification.

The way in which we aggregated the results, counting the number of risks per country/sector, has other drawbacks. However, by disclosing the basic data it, the user could examine the kind of risks listed for the country-sector combination of interest, and make a personal judgment.

Some of the limitations in this study are due to the choice of the SHDB as a data source. In the SHDB, data on sector level are rather roughly divided and for some sectors there are no data at all. However, there may be differences between e.g. different producers within a sector in a specific country. This is one reason why the S-LCA can identify risks and potential impacts, rather than actual impacts.

Limited coverage was found for ‘Access to material resources’, where for example access to arable land is not covered. The same applies to ‘Access to immaterial resources’, where issues such as land rights are missing. As these are important issues for both oil extraction and biomass cultivation, this constitutes a limitation in our results.

CONCLUSIONS AND POLICY IMPLICATIONS

Among the different fuels assessed by S-LCA in this study, various fossil fuels and renewable biofuels displayed high or very high risks of negative social impacts. Thus, the assessment clearly showed that there are substantial negative social impacts from fossil fuels, at the same levels as for biofuels. Overall, the country of origin seemed to be of more importance that the type of fuel, as the most risk-related and the least risk-related product system in our assessment referred to the same fuel type.

This indicates that there is good reason for developing policy in which strict procurement requirements for social performance are set when purchasing all types of vehicle fuel. There is currently a focus on developing sustainability criteria for biofuels, including social impacts. The results of this study indicate that this is just as important for fossil fuels. Having social criteria on biofuels, but not on fossil fuels, can be seen as unfairly benefiting fossil fuels, since meeting the criteria may involve additional investments and other costs. Thus procurement requirements on social performance must be set for purchasing all types of vehicle fuel.

Using S-LCA methodology can enable policymakers to identify where the most severe social impacts occur in the value chain, and policies can be adapted accordingly. It can also allow systematic comparison of different fuels, production pathways and social categories, so that measures can be taken to prevent negative social impacts. A screening S-LCA like this can be used to identify potential risks. To get more reliable results on a detailed level, a more detailed study needs to be conducted. By performing more thorough assessments, the schemes can be adapted to include the criteria and indicators that are the most relevant and associated with the highest risks of negative social impacts for specific fuels and/or origins.

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