

# Socio-economic analysis based on a life cycle perspective: social and societal issues of new chemicals

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## Introduction:

The two research projects are part of EU Life funded research that aims to introduce new sustainable chemicals in Europe. As part of these projects, the potential social impacts of the new chemicals were evaluated along the value chain. The TRIALKYL project aims to develop new chemical intermediates (Trialkyl phosphites) that can be used in a variety of applications, including crop protection, flame-retardants and plastic products. The IREPRO project aims to develop new low-GWP refrigerants (REFRIX products) that can be used for industrial refrigeration and air conditioning.

The goal of this work is to better understand the socio-economic effects of the introduction of new chemicals on the market. This includes to better understand the effects on the environment, as well as social and economic effects on society.

The ECHA guidance methodology (ECHA 2011) was chosen to perform the socio-economic analysis (SEA). The evaluation includes economic, health, environmental and social impacts. Similar research questions for the two cases are regarding the benefits and risks of new chemicals in Europe. The analysis includes impacts along the value chain in Europe and comparison with similar products on the market.

## Method

The socio-economic analysis (SEA) is a tool to evaluate the economic risk and benefits of an action (e.g. chemical plant) will create for society by comparing what will happen if this action is implemented or not. Under the REACH authorisation procedure (ECHA 2011), an SEA is a compulsory part of the authorisation whenever a potential risk to human health or the environment from a chemical substance occur.

The SEA methodology includes the following impacts: Environmental impacts within SEA include among others GWP and other categories within Life cycle assessment methodology. Economic impacts within SEA include all relevant impacts (e.g. investments CAPEX and operations costs OPEX). Health impacts within the SEA are impacts on human health including morbidity and mortality effects. And covers health related welfare effects, lost production due to workers sickness and health care cost. Social impacts within the SEA are all relevant impacts that may affect workers, consumers or the general public, that are not covered under health, environmental or economic impacts (e.g. employment, working conditions, job satisfaction, education of workers, and social security).

In order to improve the social assessment in the ECHA guidance methodology, other methods might be of help. The Social LCA might be a suitable method to assess and the social impacts (UNEP 2009). In order to select indicators, the Handbook for Product Social Impact Assessment (HPSIA, 2018) is a useful tool. Among the recent works in the chemical industry, the WBCSD product Social Metric guidance (WBCSD 2016) has helped to reduce the number of social indicators from 70 to a number of 25, and to a minimum of 11 social indicators. The SEEBalance method is an example of including SLCA in the eco-efficiency work in the chemical sector (Saling et al 2018)

In this paper we present the results from two research projects using the SEA methodology based on ECHA (2011) and give some suggestions on using social metrics (WBCSD 2016) for the ECHA guideline regarding social and societal issues of new chemicals.

## Results and discussion

The results of the Trialkyl project has shown that despite the costs of a new production plant (CAPEX 1.154 Mill euro), the society benefits from human health (10% reduction) and significantly from environment (30% reduction), while social impacts and jobs have only slightly been changed. Further details can be found for the pilot plant (Brunklau et al 2017) and recent results on the project webpage (TRIALKYL 2020).

The preliminary results of the IREPRO project is based on theoretical values and indicate the following: Environmental benefits (99% reduction of HFCs GHG emissions, 66% energy savings). Economic benefit (Cost saving in production 20%). Health benefits (safeguarding contribution). Social benefits (5% increase of jobs).

Reflections and suggestions on using SLCA for the ECHA guideline regarding social and societal issues of new chemicals.

The WBCSD (2016) product Social Metrics guidance is based on SLCA methodology (UNEP SETAC 2009) include balanced and sector-specific guidance for the chemical sector. The guide addresses both positive and negative social impacts • It covers the key impacts that might be generated by a chemical product during its life cycle: • Regarding three key stakeholders (workers, local communities, consumers) • Among five social areas (Basic rights and needs, Employment, Health and safety, Skills & knowledge, Well-being). The guidance covers material social issues for chemical products, within a selection of 25 social topics (of in total 70 social topics). The guidance minimum of 11 social topics excluding e.g appropriate working hours and job satisfaction.

The ECHA guidance for SEA include social impacts related to employment, job creation, working hours, job satisfaction. However these are more seldomly used since the focus lies on health issues and environmental issues. On the other hand the societal impacts include aggregated results of all the key parameters in one indicator, the socio-economic indicator in terms of economic value. The economic value for health impacts can be calculated in different ways (DALY per capita, willingness to pay, medical costs) based on WWF report “social impacts of chemicals” (ECHA 2011). Such an indicator might also be questionable in the light of “basic rights” in SLCA, while usable in the investment situation of a chemical plant and the production of new chemicals.

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**Key words:** socio-economic analysis, life cycle perspective, social and societal issues, SLCA, chemicals

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