NANORIGO

	Executive Summary D 3.1
DELIVERABLE TITLE	Description of the Strategic Radar System
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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement nº814530 This document reflects only the author's view and the Commission is not responsible for any use that may be made of the information it contains.

Executive Summary

The multiple criteria decision analysis (“Screening MCDA”) developed in the EU-project NANORIGO is designed to assist its users in a screening process on whether the use or development of a nanomaterial (NM) is beneficial. It considers the potential impact of nanotechnology on the environment, society and the economy. It serves as a strategic radar system to identify promising technological opportunities in a culture of innovation. It is dedicated to stakeholders from industry, research, governance, organizations for consumer or nature protection and not least the interested public to contribute to processes of reflexive innovation.

The main idea for MCDA in NANORIGO is to take up developments in probabilistic algorithms for decision support and experience with previous tools to create a robust and easy to use screening system that provides a rough overview on the performance of nanomaterials and its alternatives. In a prospective approach, uncertainty regarding the final design of processes or products and also the application context complicate investigations. Prospective technology assessment therefore, has to find ways to handle the associated non-knowledge. A probabilistic approach represents an option to deal with this challenge.

The screening MCDA determines a **benefit profile** of different material options for the criteria of environmental impact (related to life cycle assessment, LCA) and socio-economic aspects (socio-economic assessment, SEA) (Figure 1). The applied criteria are weighted according to their relevance either by the user or by a predefined set of weights.

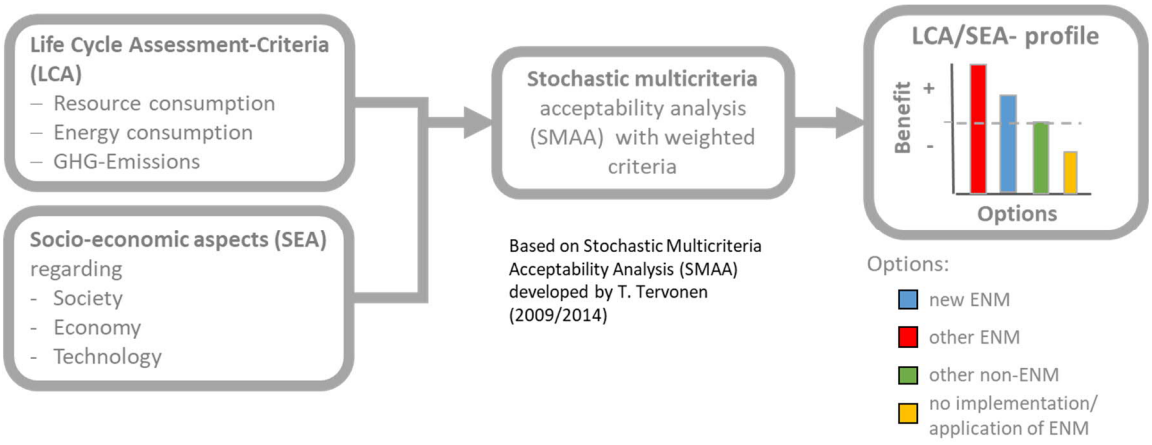

Figure 1: Simplified scheme of screening MCDA. Different material options are compared based on their performance under LCA and SEA criteria.

The **criteria** relate to properties of the material that are specific to the production, use and end-of-life phases. For the selection and weighting of criteria, an audience of experts and stakeholders was involved through several surveys where they could express their opinion anonymously. Input for the criteria is obtained via a questionnaire. For all categories of evaluation, the information needs are kept as low as possible. Depending on the experience level of the user, the questionnaire is divided into three **tiers** (Inexperienced, Advanced, and Experienced) which

unfolds with the experience of the user. Input is accepted in the form of semi-quantitative estimations without the need to keep exact numbers at hand.

A comparison is required to evaluate the relative performance of the new NM. Therefore, the NM being evaluated is compared to a **reference alternative**, such as the material on the market (for example, a non-NM or other NM or even the "no action/no additional material" option (see Figure 1). The result shows the option that performs best with respect to the criteria studied.

Screening MCDA applies a probabilistic approach to cope with uncertainties and lack of knowledge. It uses the Stochastic Multicriteria Acceptability Analysis (SMAA) open source software developed by Tommi Tervonen (Tervonen, 2014) to rank material options. Results can thus be obtained even with incomplete input for the socio-economic and environmental impact.

Conclusion

Screening MCDA in the context of the Risk Governance Framework is intended to become a screening tool to avoid path dependencies in later stages of innovation processes and is therefore designed to provide access to this method for a wider range of users.

The following aspects characterise the progress of Screening MCDA:

- Different material options (not only nanomaterials) can be ranked (and compared) according to their acceptability with regard to numerous criteria at once
- The proposed approach exploits the full power of MCDA by using weighting to account for the varying relevance of its criteria and improve differentiation between comparable alternatives
- The graduated structure of knowledge requirements for the input is designed to be suitable for both laypersons and experts
- Imprecise input information (even ranges or no input for some criteria) is accepted
- No absolute values are needed, the analysis only requires semi-quantitative information

References

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