

Decision support by a Screening-Multiple Criteria Decision Analysis (Screening-MCDA)

Nanorigo Deliverable 3.1

Bernd Giese, Carina R. Lalyer, Sebastian Purker

Institute of Safety and Risk Sciences (ISR),

University of Natural Resources and Life Sciences (BOKU), Vienna



This project has received funding from The European Union's Horizon 2020 Research and Innovation Programme under Grant agreement 814530.

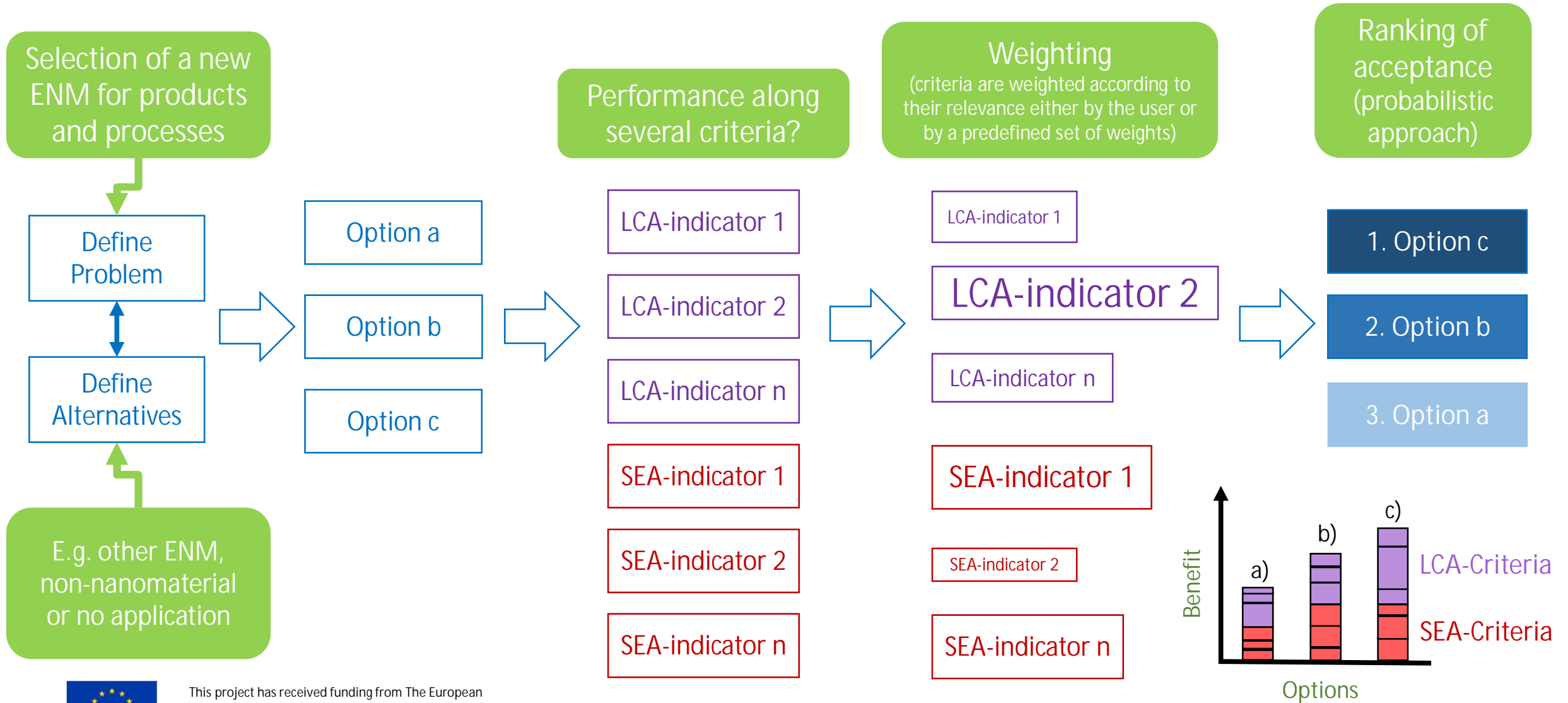


... is designed to

- support decision making in early stages of product development or assessment
- be an aid for stakeholders from various fields (e.g., producers, civil society organizations, regulators)
- compare alternatives based on multiple criteria to meet different objectives
- accept imprecise input information
- be suitable for both laypersons and experts
- consider the potential benefit of nanotechnology for the environment, society and the economy
- presenting the best alternative according to scores and weights

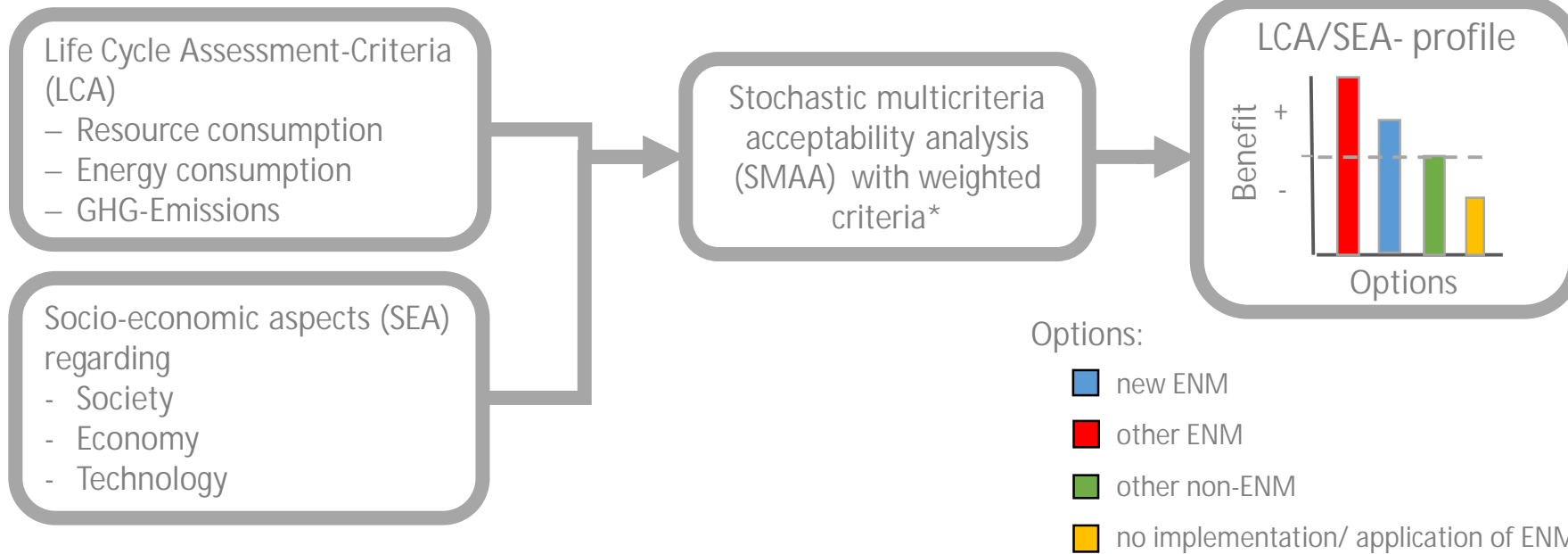


Steps of the Screening-MCDA



This project has received funding from The European Union's Horizon 2020 Research and Innovation Programme under Grant agreement 814530.

MCDA/PERST Process Scheme



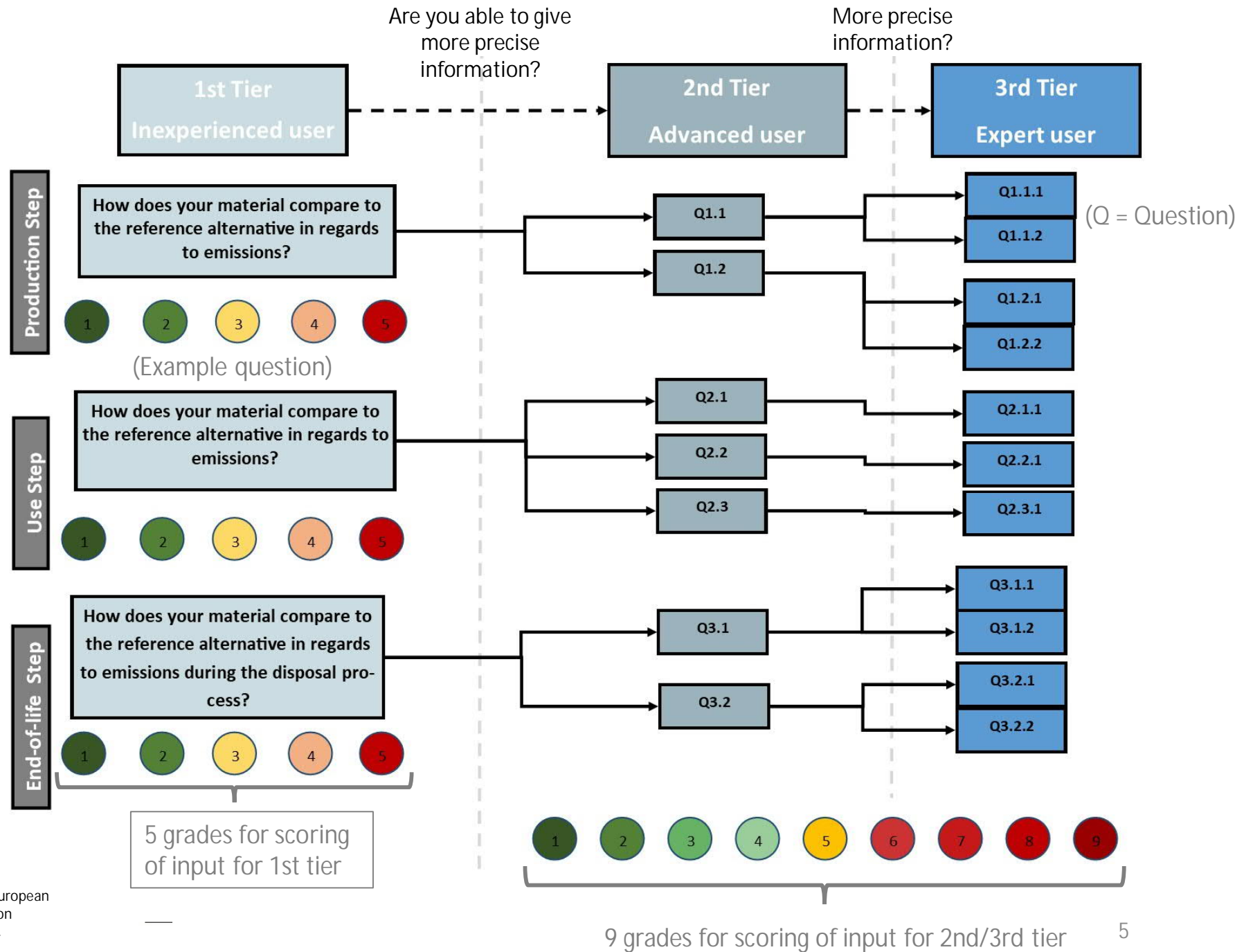
Screening MCDA determines a benefit profile of different material options for the criteria of environmental impact (related to life cycle assessment, LCA) and socio-economic aspects (socio-economic assessment, SEA). The applied criteria are weighted according to their relevance either by the user or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

*Based on Stochastic Multicriteria Acceptability Analysis (SMAA) developed by T. Tervonen:

- Tervonen, T., Figueira, J.R., Lahdelma, R., Dias, J.A., Salminen, P., 2009a. A stochastic method for robustness analysis in sorting problems. *Eur. J. Oper. Res.* 192, 236–242. <https://doi.org/10/cjnpc5>

- Tervonen, T., 2014. JSMAA: open source software for SMAA computations. *Int. J. Syst. Sci.* 45, 69–81. <https://doi.org/10.1080/00207721.2012.659706>

Questionnaire Process:



Criteria of Screening-MCDA

- Impact areas and corresponding criteria were selected by two surveys (researchers, industry, CSOs, regulators involved)
- Total of 56 criteria
- Criteria based on life cycle assessment (LCA) aspects:

Production Step	Use Step	End-of-life Step
Resource consumption Emissions	Resource consumption Emissions	Emissions Recyclability Disposal management

- Criteria based on socio-economic (SE) aspects

Society	Economy	Technology
Employment (P) Societal resilience (U) Societal needs or objectives (U)	Accessibility to consumers (U) Vertical range of manufacture (P)	Technological advancement (U) Employee safety (P, EOL) Profitability (U)

U = Use Step
P = Production Step
EOL = End-of-life Step

