An SSbD integrated impact assessment framework for advanced materials developed by SUNRISE

Lisa Pizzol[1], Arianna Livieri[1], Alex Zabeo[1], Sarah Devecchi[1], Alberto Katsumiti[2], Andrea Brunelli[3], Michaël Saidani[4], Konstantina Koutsiara[5], Carlos Fito[6], James Baker[7], Blanca Suarez-Merino[7], Stella Stoycheva[8], Yasemin Ertugrul[8], Hubert Rauscher[9], Irantzu Garmendia Aguirre[9], Danail Hristozov[10]

1. Introduction

The European Green Deal policy aims outlined in the Chemicals Strategy for Sustainability and the Zero Pollution Action Plan emphasize the need for a transition towards a Safe and Sustainable by Design (SSbD) approach to chemicals and materials (EC, 2019; EC, 2020). This initiative seeks to transform the EU into a modern, resource-efficient, and competitive economy by turning environmental, health, safety, and sustainability challenges into opportunities in various policy areas, including chemicals. To support this transformation, the European Commission (EC) has recommended the establishment of a European assessment framework for SSbD of chemicals and materials, based on a holistic approach developed by the EC's Joint Research Centre (EC, 2022; C. Caldeira et al., 2022). To support the practical implementation of the EC-JRC framework by stakeholders, especially industry, the Horizon Europe SUNRISE project received funding to develop integrated approaches for health, environmental, social, and economic impact assessment of products enabled by advanced materials (AdMa).

2. Methods

The SUNRISE project combines the bottom-up development of methods for assessment of health, environmental, social and economic impacts with their top-down integration in an overarching Integrated Impact Assessment Framework (IIAF). This framework is designed to support SSbD decision-making along supply chains and lifecycle stages of AdMa and their products. The process of developing and testing the IIAF in cocreation

[1] GreenDecision srl, Cannaregio 5904, 30121 Venezia (VE), Italy; lisa.pizzol@greendecision.eu
[2] GAIKER Technology Centre, Basque Research and Technology Alliance (BRTA), Zamudio, Spain
[3] Department of Environmental Sciences, Informatics and Statistics, Ca' Foscari University of Venice, Venice, Italy
[4] LIST Luxembourg Institute of Science and Technology, Environmental Research and Innovation Department, Esch-sur-Alzette
[5] HYPERTECH SA, Perikleous 32, 152 32 Chalandri, Greece
[6] ITENE Parque Tecnológico: C/ Albert Einstein nº 1, 46980 Paterna, Valencia, Spain,
[7] TEMAS Solutions GmbH, Lätteweg 5, 5212 Hausen. Switzerland,
[8] Yordas Group, Äußere Nürnberger Straße 62, 91301 Forchheim, Germany,
[9] European Commission, Joint Research Centre (JRC), Ispra, Italy,
[10] EMERGE Ltd, Sofia, Bulgaria

with the stakeholders within a trusted real-world environment will improve our understanding of potential safety and sustainability trade-offs. This new knowledge will be transferred to regulators and policy makers at EU and national level to support them in the implementation of SSbD-related policies for chemicals and materials.

3. Results

The IIAF, fully aligned to the EC-JRC SSbD framework, is a 4-tiered approach with each tier corresponding to an integrated methodology (supported by a toolbox) for health, environmental, social and economic impact assessment targeting different groups of users at different stages of the innovation process and requiring a different level of data and expertise. Tier 0 is a fast-screening method based on a questionnaire composed of 18 key questions designed for situations when an innovator needs to prioritise from a high number of possible design alternatives, which is a typical scenario for large industrial companies. Tier 1 is further qualitative screening at the early R&D stages of the innovation process that aims to identify hotspots of possible safety and sustainability concerns along the lifecycle. Tier 2 is a semi-quantitative assessment based on a weight-of-evidence approach applied in the product optimisation phase when a mix of qualitative and quantitative data are already available. Finally, Tier 3 involves a comprehensive quantitative safety (regulatory risk assessment) and sustainability (LCA (Life Cycle Assessment), LCC (Life Cycle Costing), and S-LCA (Social Life Cycle Assessment)) analysis for materials/products to be released on the market. To support generation of robust input data for the integrated methodologies we will develop and apply Integrated Approaches to Testing and Assessment (IATA), New Approach Methods (NAMs) as well as screening level and more advanced sustainability assessment tools based on LCA, s-LCA, LCC, Cost-benefit Analysis (CBA), and circularity analysis on a global scale.

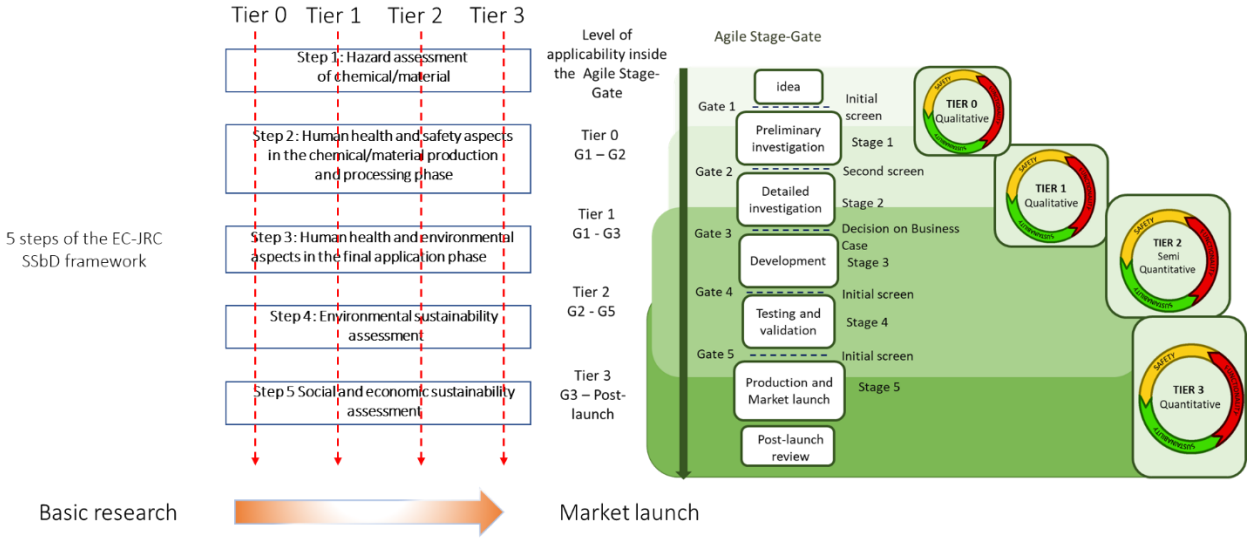

Figure 1: SUNRISE 4-tiered Integrated Impact Assessment Framework.

4. Conclusion

Implementation of the IIAF will ensure better regulatory compliance for AdMa based products and can have an impact on shortening the time of new materials/products to

reach the market, thereby supporting the Green Deal policy objectives for the transformation of the EU into a modern, resource-efficient and competitive economy.

5. References

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