Safe and sustainable by design roadmaps. A glimpse of the ASINA case studies

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1. SSbD concept

The Safe and Sustainable by design (SSbD) framework from the Joint Research Centre (JRC) seeks the definition of SSbD criteria and evaluation procedures for chemicals, (nano)materials and processes. Developed within the action plan of the European Chemicals Strategy for Sustainability (CSS), the framework foresees the assessment of the entire life cycle of a compound, capturing the human and environmental safety aspects, and the environmental, social and economic sustainability dimensions in the approach. The dimensions covered in the framework are shown in Figure 1 demonstrating the re-design phase supported by a hypothesis formulation and the dimensional targets: functionality, safety across life cycle (e.g., intrinsic hazard, human and environmental safety during production and use phase), and environmental & socio-economic sustainability aspects. For each dimension criteria are envisaged to stimulate sustainable research and innovation, beyond the current regulatory requirements.

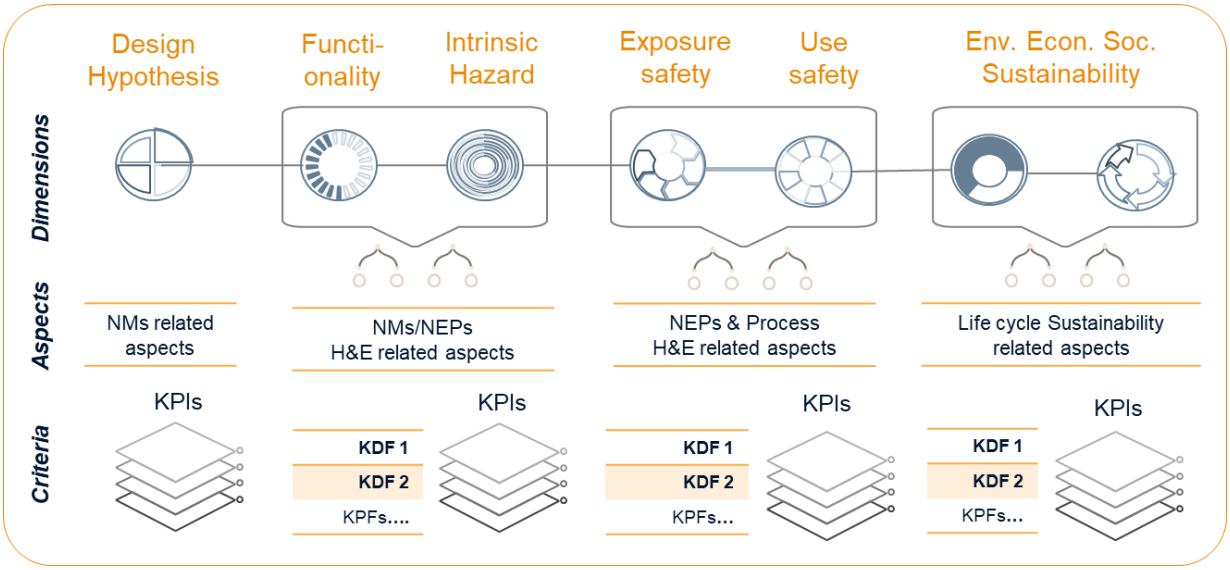

Figure 1. Dimensions, aspects and criteria of the SSbD framework, following a hierarchical approach in which functionality & safety aspects are considered first, followed by process related safety and environmental sustainability and economic aspects, while assuring product functionality. The SSbD approach within ASINA captures Key Performance Indicators (KPIs) in each dimension, Key Decision Factors (KDFs) and Key Performance Factors (KPFs).

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2. ASINA project

ASINA utilizes the structure of the framework in distinct case studies, within the context of nanotechnology. Societal aspects were outside the scope of the project. ASINA supports the re-design of the materials, products and processes by evaluating alternative scenarios within the case studies to improve safety and sustainability of the alternative SSbD solutions. The application of the SSbD concept involves identification of material/product design alternatives at the early stage of the innovation process to reduce the potential for release of hazardous chemicals/materials and/or decrease their hazard, while retaining functionality for their intended uses.

3. The roadmap.

In this presentation we will show the

1. measurable quantitative (either numeric of binary) or qualitative (based on relative comparison) criteria as Key Performance Indicators (KPIs)
   KPIs are based on defined aspects (e.g. health or environmental) measured with an assessment method (experimental, modelling, data-driven) and compared with thresholds or target values when available, based upon the decisions on this comparative SSbD assessment are made.
2. KPIs are strongly depended on Key Decision Factors (KDFs) that allow the differentiation among the final KPIs and thus, the SSbD alternative solutions. Those KDFs can be altered by the designer and allow a degree of freedom in the “re-design” aspect on the SSbD framework.
3. KPIs are depended of Key Performance Factors (KPFs) that differentiate the results but are not manageable by the designer, but are recognised to have a significant effect on KPIs.

In this manner, we are able to provide specific KPIs in each dimension of the frameworks followed by their most important KDFs and KPFs providing future SSbD implementations a scientifically sound basis as a starting point of departure.

4. Conclusions

Being transparent can help ongoing/future projects trying to achieve similar objectives, to get inspired and reach sound scientific approaches. In addition, demonstrating the ASINA cases, might align the efforts towards a common roadmap for executing a SSbD approach, ultimately, promoting the EU ambitious Green Deal goals. Finally, the roadmap acts as an illustrative tool to stakeholders to facilitate engagement and dissemination of results.