



Taking a targeted approach to tackle mixture toxicity

The EU Chemicals Strategy for Sustainability will introduce legal requirements to address the issue of exposure to unintentional mixtures of different chemicals in the environment. A so-called Mixture Allocation Factor (MAF) would be applied to all chemical risk assessments under REACH to ensure that the unintentional exposure to a variety of substances remains safe for people and the environment.

How we assess risk

Imagine commuting to work by bike everyday: Sometimes, risks might occur at the same time. Pedestrians cross your way, and a car takes a sudden left turn without signaling. As a rider you take precautions, such as wearing a helmet and protective gear, and keeping a safe distance. The same is true for the world of chemistry. Toxicologists assess the acceptable risk from exposure to REACH registered individual chemicals or intentional mixtures.

What about the risk of unintentional mixtures? We are surrounded by and exposed to multiple chemicals at the same time. To cover uncertainties, we include a number of conservative safety factors in the risk assessment of individual substances, thereby ensuring that we can be reasonably sure that our products are handled safely.

What is the EU Commission's solution?

To address potential risks from chemical mixtures, the EU Commission wants to introduce one or several mixture allocation factors (MAF), previously called mixture assessment factor, in REACH to account for unintentional mixtures. The name change reflects the complexity of the MAF: In its case, scientific assessment is not feasible due to a lack of data, which is why allocation is a more adequate descriptor¹. The EU favors a simple solution, such as a generic MAF: one mixture allocation factor for all substances and uses. With that, the MAF can be considered a precautionary measure covering cumulative effects that unintentional mixtures may have.

When is mixture toxicity a risk?

Mixture toxicity becomes relevant when adverse effects of two or more substances add up **at the same time and the same place**. Accordingly, unintentional mixtures at critical levels occur in hot-spots and are not a regular issue. In very exceptional cases, while the individual substances alone were safe, the unintentional

Screening of potential combined risk posed by environmental mixtures

90% of all observed unintentional mixtures of chemicals found in surface waters present no concern. Another 5% of cases which pose some concern can be avoided by stricter enforcement of existing environmental legislation for single substances.

Around 5% of identified mixtures may pose concern which may be resolved by the application of a MAF.²

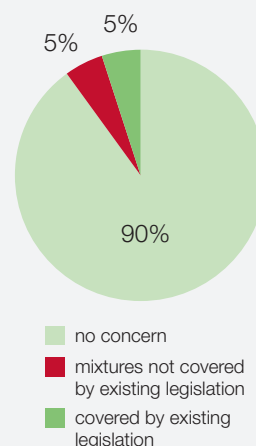


Figure 1

exposure to several substances led to an unacceptable risk for the environment. Typically, very few substances were responsible for the excess of risk and it is reasonable and effective to focus on substances that pose actual risk (see Figure 1).²

What are the consequences of a generic MAF?

Consultants for the European Commission found out that a MAF of 10 would result in a withdrawal of 35% of uses already

Two or more substances with adverse effects add up at same time, same place



with relevance for the environment, and another third of the uses would require more stringent measures to mitigate the risk accordingly³. Similar results were obtained by the independent consultancy Ricardo.⁴ When analyzing the effect on two specific high-volume substances, the economic impact on the chemicals industry and across the supply chain were calculated when a MAF of 10 would be introduced. In this scenario, several products for certain uses would be taken off the market, triggering severe sales losses of 20-50% even though no direct harm has occurred⁵.

What is our solution?

Taking a two-step approach for environmental risk assessment of mixtures

A targeted MAF for specific substances and uses that have been identified as risk drivers will help to close the gap precisely for those mixtures and circumstances which may pose concern but are not yet covered by the current legislative framework. We propose a two-step approach for environmental risk assessments:

1. Identify substances and standard use cases which might generate a mixture effect: a significant environmental hazard plus relevant release to the environment. (Figure 2)
2. For those chemicals identified as risk-driving substances via the decision tree, a MAF of 3 is suggested to be applied in the environmental risk assessment. This number is based on an independent analysis of available environmental monitoring data for the EU, including a comprehensive elaboration and evaluation of various MAF approaches⁵.

Protection of the general public

Chemical risk assessments are based on very conservative models and applied by several specific regulations, for example regulations regarding food contact materials, cosmetics, and medical devices. In addition, reducing risks to the environment, e.g. air, drinking water or soil, results in better protection of human health due to decreased indirect exposure to chemicals. Consequently, the use limitations based on a generic MAF are disproportionate to the additional gain of protection to the general public.

Health and safety risks at the workplace

At the workplace, the risk-driving chemicals are known, and applicable OSH (Occupational Safety and Health) regulations require their health and safety risks to be assessed and managed by the employer, on a mandatory basis. In this setting, chemical safety is achieved by professional risk mitigation measures that significantly exceed the risk management measures available to consumers. To enhance protection of workers, EU-wide minimal requirements for safe chemicals management should be established and complemented by a workers' training passport.

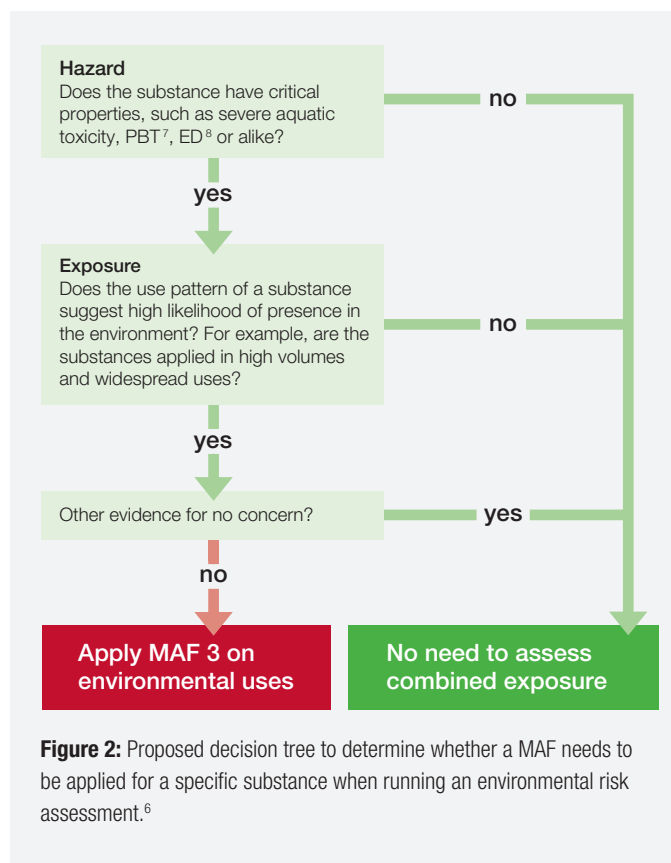


Figure 2: Proposed decision tree to determine whether a MAF needs to be applied for a specific substance when running an environmental risk assessment.⁶

Active ingredients are covered in existing regulations

The assessment of mixture toxicity of active ingredients is already regulated in respective EU legislations. MAF considerations under REACH cannot simply be extended to regulations for plant protection products, feed and food additives, or pharmaceuticals.

BASF's viewpoint

Application of a mixture allocation factor should be limited to hazard properties and use cases, where a tangible improvement of risk mitigation is plausible. BASF considers an effective regulatory approach for the introduction of a MAF:

- ▶ To be realistic, proportionate, and targeted to uses
- ▶ To build on evidence by solid scientific data and knowledge
- ▶ To integrate the outcome of an impact assessment
- ▶ To leverage already existing legal and/or regulatory requirements
- ▶ To assess socio-economic aspects
- ▶ To ensure suitable transition periods

Two ways. One Goal.

Let's work on tailored solutions to minimize risks in a targeted way.



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¹ CARACAL-48: REACH revision overview and specific questions for consultation presentation | 28/03/2023

² Arche Consulting: Characterising chemical co-exposures in EU to support a combined exposure assessment strategy, 2021.

³ Wood E&S GmbH: MAF Workshop background document, April 2022 (Document Ref: 807420-WOOD-ZZ-XX-TN-OP-00003_S4_P01.01)

⁴ Economic Analysis of the Impacts of the Chemicals Strategy for Sustainability – Case study: Mixture Assessment Factor Ref: ED 14790 | Final Report | Issue number 1 | 11/04/2022

⁵ Arche Consulting: Comparison of MAF methods applied to environmental monitoring data, 2021

⁶ <https://cefic.org/policy-matters/mixture-assessment-factor>

⁷ Persistent, bioaccumulative and toxic

⁸ Endocrine disrupting