BASF
We create chemistry

Sustainable Solution Steering

Manual, April 2018

Table of Contents

List of Figures

Glossary and Abbreviations

CLP Regulation	Regulation (EC) No 1272/2008 on the Classification, Labelling and Packaging of Substances and Mixtures
CMR	Carcinogenic, Mutagenic or Toxic for Reproduction
ECHA	European Chemicals Agency
EHS	Environment, Health and Safety
ELoC	Equivalent Level of Concern
EU	European Union
OECD	Organisation for Economic Co-operation and Development
PBT	Persistent, Bioaccumulative and Toxic
REACH Regulation	Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals
R&D	Research and Development
RC	Responsible Care
RCMS	Responsible Care Management System
SDGs	UN Sustainable Development Goals
Verbund	In the BASF Verbund, production facilities, energy flow, logistics and infrastructure are intelligently networked with each other in order to increase production yields, save resources and energy, and reduce logistics costs.
vPvB	Very Persistent and Very Bioaccumulative
WBCSD	World Business Council for Sustainable Development

1. We Create Chemistry for a Sustainable Future

We want to contribute to a world that provides a viable future with enhanced quality of life for everyone. We do so by creating chemistry for our customers and society and by making the best use of available resources. We live our corporate purpose “We create chemistry for a sustainable future” by

- Sourcing and producing responsibly,
- Acting as a fair and reliable partner,
- Connecting creative minds to find the best solutions for market needs.

For us, this is what successful business is all about. This ambition is directly linked to a number of business factors:

- Growing customer needs to differentiate with sustainability
- New regulations, standards and commitments related to sustainability in all value chains
- Changing societal and business environments prompting demand for sustainable products.

Sustainability is becoming an increasingly important key factor for growth and value creation. We therefore cooperate with our customers and value chain partners in creating and driving more sustainable solutions while discontinuing products with sustainability issues in their specific application. This helps to support customers with solutions which contribute to current and future sustainability needs. Our purpose summarizes BASF’s aim to combine economic success, social responsibility and environmental protection: We create chemistry for a sustainable future.

1.1 How We Live our Company Purpose

BASF is committed to respect and promote internationally agreed standards regarding compliance, environmental protection, health and safety and decent work. Adherence to these standards is important to avoid strategic, operational or reputational risks. Besides taking account of sustainability aspects in the process of acquisition, BASF expects its suppliers to be committed to and actively support the implementation of the principles of sustainable development within their sphere of responsibility.
BASF engages in an ongoing dialog with stakeholders like customers, employees, shareholders, neighbors, workers’ representatives, politicians, media, civil society and business partners. This ongoing dialog not only supports BASF in recognizing sustainability issues at an early stage, it also lays the ground for identifying market needs and turning them into product solutions.
Sharing the knowledge about the Sustainable Solution Steering methodology can help customers and other third parties to analyze their portfolio and steer it towards their sustainability targets.

1.2 BASF’s Sustainability Understanding

Sustainable development is a broad term that is open for interpretation. A common understanding of the term is essential for leveraging sustainability as an important growth driver for business. Besides taking advantage of business opportunities, BASF’s sustainability management has two further strategic responsibilities: minimizing risks and establishing strong relationships with internal and external

stakeholders. To do so, BASF has defined its understanding of sustainable development based on the United Nations' definition:

Humankind is in a dilemma situation as human beings consume more than earth can regenerate. While the global population is growing, rising demands have to be met at present and in future. This will pose great challenges on the planet. Yet, these challenges open up many opportunities for the chemical industry. With its high-value products and intelligent solutions, BASF is in a great position to address global challenges and contribute to sustainable development, particularly in the following areas: resources, environment and climate, food and nutrition.

The ambition to create sustainable products and services is being driven by a number of compelling business factors. New laws and standards regarding carbon emissions and other sustainability topics are being implemented, or look set to be enacted, all over the world. At the same time, there is growing market uncertainty about the cost of raw materials and the availability of natural resources. Finally, the end consumers are evolving their expectations about the goods and services they purchase. Increasingly, they are holding brand owners and companies to a higher account in terms of materials that go into consumer products and the way those products are made, this includes also the respect of human rights along the supply chain. In short, for BASF and for our customers, creating more sustainable products and solutions makes good sense. For us, sustainability is about enabling long-term business success.

2. Objectives of Sustainable Solution Steering

To evaluate how a company's current portfolio contributes to the purpose of a more sustainable future, the Sustainable Solution Steering method was developed in 2012 by BASF. The objective of Sustainable Solution Steering is to provide us with a fully transparent and consistent evaluation of the sustainability performance of BASF's solutions. It provides the basis for actively steering a portfolio towards a more sustainable profile. This manual provides details on what Sustainable Solution Steering is about: how to apply it and how it can help to meet the needs of customers, government and society to sustainably grow the business.

Sustainable Solution Steering was introduced at BASF with the aim to increase our portfolio of innovative and sustainable solutions and make our customers more successful. By identifying key drivers and issues in our customers' industries, we intend to assess the sustainability contribution of each of our products in its specific application. In order to do so, solutions in their respective application and region are reviewed in terms of defined sustainability criteria.
With our approach we evaluate the value chain from cradle to grave considering industry and region-specific views in our markets. We strive to achieve a balance between the three dimensions of sustainability:

- Economy, e.g. potential cost savings for customers using of our technologies
- Environment, e.g. ensuring standards are met, developing environmentally sound solutions
- Society, e.g. enhancing safety in production, use or end of life.

The results derived from the evaluation of the value chain supports the business divisions in gaining a clear picture of sustainability concerns and drivers within the current and future portfolio. In this respect, the performance assessment serves as an early warning system. We intend to identify solutions which will likely be affected by regulations and/or a negative market perception in the future at an early stage. Where deemed required, mitigation options for solving the sustainability issue(s) are developed within the process of segmentation.
In addition, the tool serves as steering instrument triggering sustainability-related innovations that ensure differentiation in the markets through their contribution to improve quality of life. This provides content for a consistent market communication and hence generates business opportunities.

Sustainable Solution Steering is embedded into BASF's sustainability management. Several strategic responsibilities are meant to ensure an efficient integration and coordination of the outcomes of the segmentation process in the organization. Using a cross-functional workshop setup, Sustainable Solution Steering reaches and involves a large number of employees and thus supports the anchoring of sustainability in a company's daily business. By the end of the Sustainable Solution Steering process, employees in various positions and functions such as R&D, Marketing, Sales, Strategy or Product Stewardship will have been engaged in sustainability in a structured and consistent approach.

In a nutshell, the tool helps to enable company's long-term economic success while improving environmental and social performance.

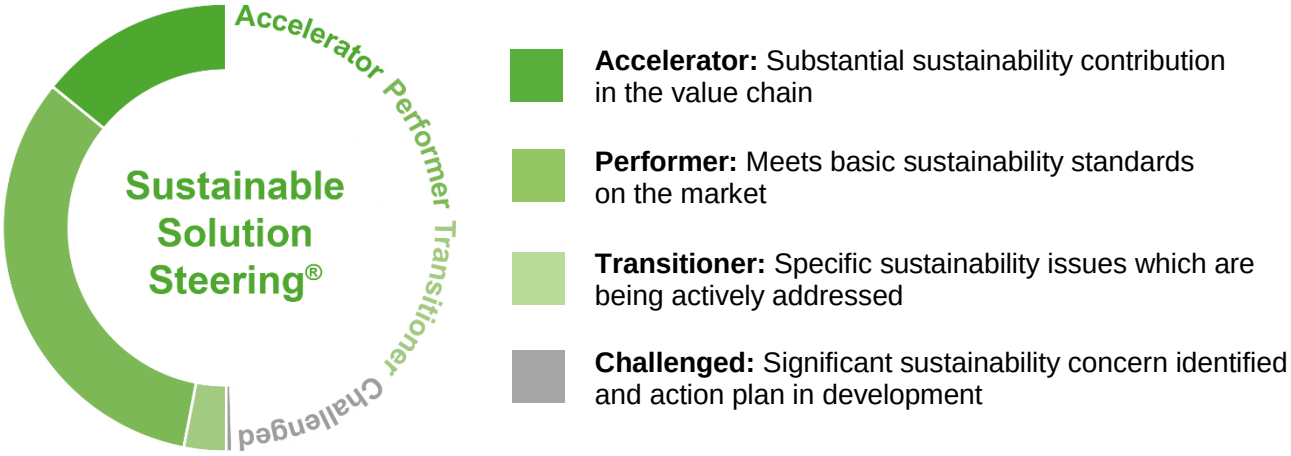
3. Sustainable Solution Steering Methodology

BASF manages a broad portfolio of more than 60,000 solutions in more than 80 business units globally. In order to gain a comprehensive understanding of our sustainability topics and opportunities, we have created a robust and scalable evaluation process which accounts for our upstream, intermediate and downstream businesses as well as regional market differences. Applying Sustainable Solution Steering, solutions are evaluated in a cradle-to grave value chain approach including raw material supply, production, usage phase and end of life, e.g. disposal or recycling. The assessment takes account of industry and customer specific requirements and evaluates the solution's sustainability contribution compared to alternative solutions in the market. It is based on a combination of scientific evidence, expert judgments as well as market knowledge and perception.

3.1 Sustainable Solution Steering Categories

The Sustainable Solution Steering approach reflects the full range of sustainability performances, ranging from solutions with a substantial sustainability contribution, to solutions with market standard performance, up to solutions with a significant sustainability concern. Within the Sustainable Solution Steering process, solutions of BASF business portfolios are grouped into four categories according to their sustainability performances in the respective application, industry and region.

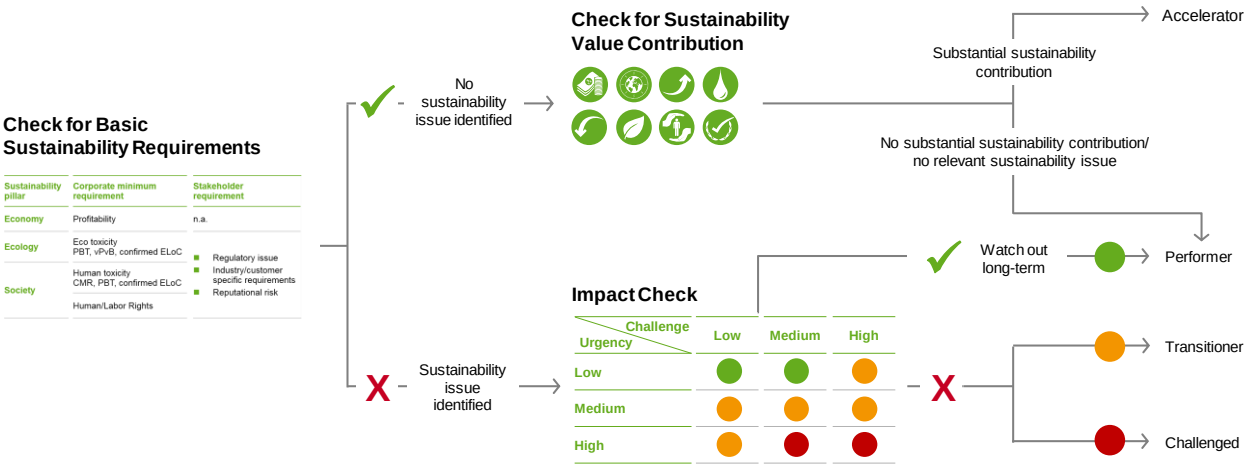
Figure 1: Sustainable Solution Steering Categories



3.2 Process Flow

In the first step, all solutions of a business unit portfolio are subject to a so-called “Check for Basic Sustainability Requirements” (see 3.4) to systematically and proactively identify solutions which are likely to be affected by a sustainability issue, either at present or in the foreseeable future. Within this check, each solution in its respective application and region is evaluated based on corporate minimum and stakeholder specific economic, environmental and social criteria.
Solutions which are identified as likely to be affected by a sustainability issue are subject to a separate Impact Check (see 3.5) for analysing the significance of the sustainability issue in a following step.
Solutions which have successfully passed the initial Check for Basic Sustainability Requirements are then, in a second step, subject to a Check for Sustainability Value Contribution (see 3.6) which intends to evaluate the solution’s sustainability contribution compared to competitive solutions in the same application and region.

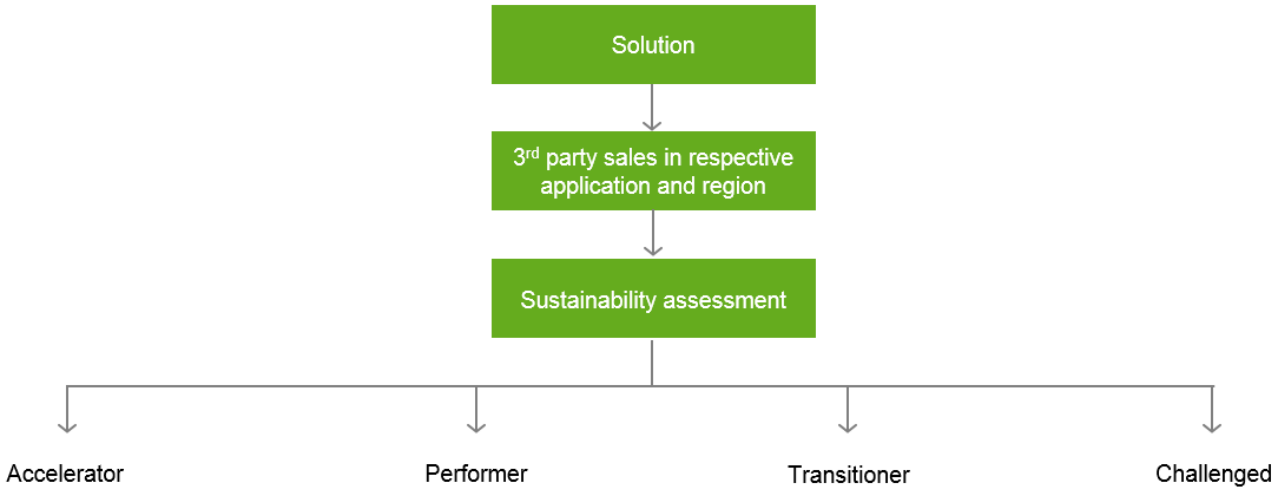
Figure 2: Sustainable Solution Steering Process Flow



3.3 Scope and Boundaries

The Sustainable Solution Steering method covers BASF's group-wide sales to third parties in the respective fiscal year. Products for captive use within BASF's Verbund are not considered in the process. In addition to sales to third parties, the method is applied to divisional research projects.

Figure 3: Sustainable Solution Steering Logic



Other operating activities, e.g. non-product related businesses, such as company restaurants or IT services, are excluded from the Sustainable Solution Steering as well as the following non-core BASF businesses:

- Tolling operations
- Other trading activities
- Sale of remainders
- Solutions sold under license
- Equipment sales: not chemical products but necessary to sell our solutions
- Phased-out solutions where turnover is accrued, but no further production is scheduled.

3.4 Check for Basic Sustainability Requirements

As global company with a focus on environment and health and safety, we advocate that chemical substances must not pose risks to human health or the environment. We therefore strive to adhere to the highest environment, health and safety (EHS) standards, and to procure that our solution portfolio complies with all applicable national, state and local legal requirements. In addition, each solution needs to contribute to our own economic goals.

However, a solution which is currently compliant with the applicable legislation in its respective application and region, and is also demanded from customers, may face stricter legal requirements in the future, or be subject to negative consumer perception or public pressure. To proactively identify solutions that are likely to be affected by a sustainability concern either immediately, or in the foreseeable future, we conduct our Check for Basic Sustainability Requirements which is designed to cover all three dimensions of sustainability: economy, environment and society.

Undergoing the Check for Basic Sustainability Requirements, BASF's solutions in their respective applications and regions are reviewed to evaluate their compliance with our corporate minimum requirements as well as stakeholder requirements (see 3.4.1 to 3.4.5):

Corporate minimum requirements:

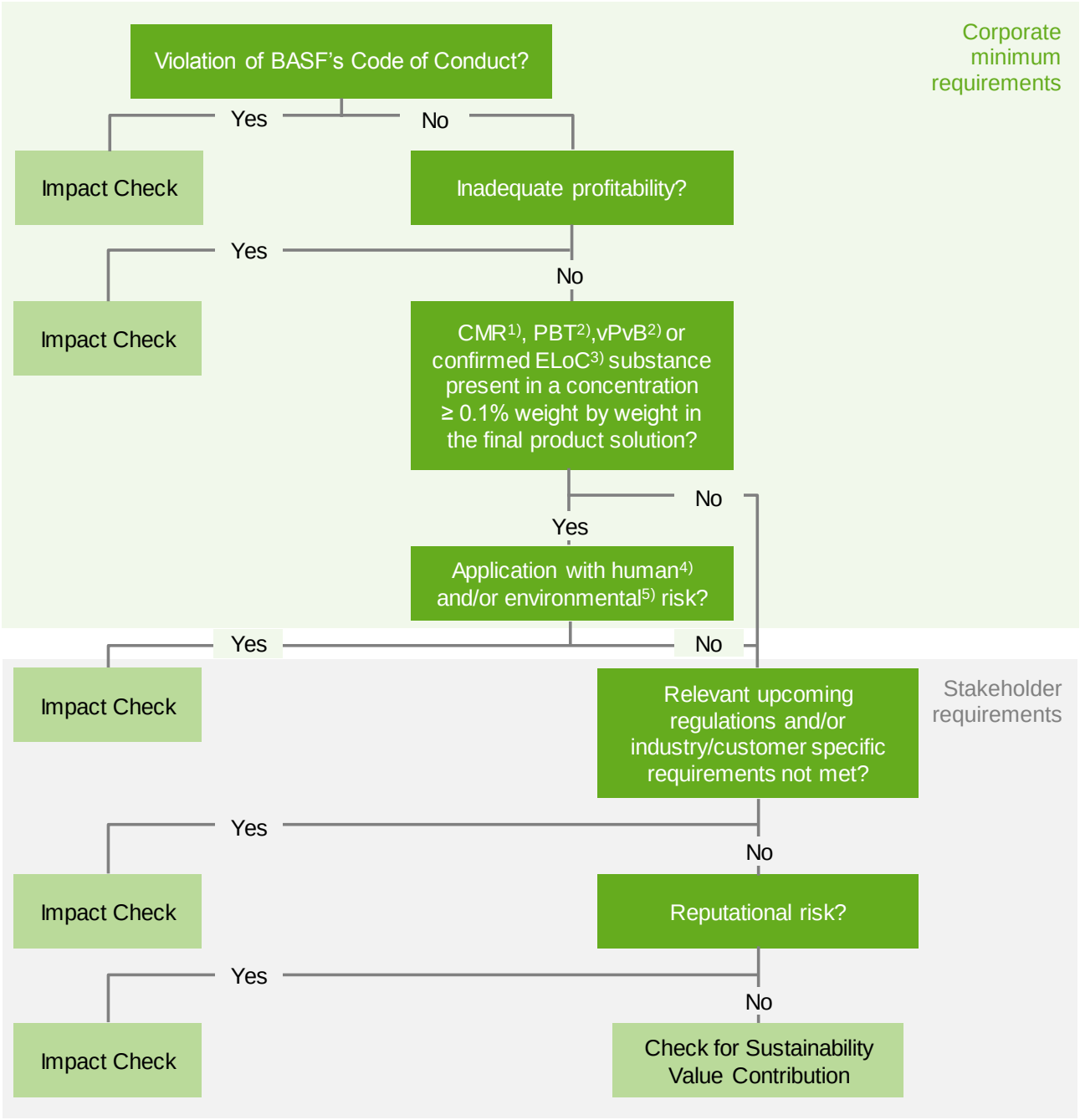
- Corporate-wide minimum demands which BASF solutions across all regions are required to fulfill
- BASF's commitment to legal compliance and responsible business conduct
- Compliance with corporate minimum requirements is monitored by corporate functions and Corporate Sustainability.

Stakeholder requirements:

- Adapted to industry and regional demands
- Definition of requirements is proposed by respective business unit, corporate functions and Corporate Sustainability, decision on the fulfilment is made by corporate functions and Corporate Sustainability.

In case any sustainability issues are identified in the Check for Basic Sustainability Requirements, the solution is subsequently subject to the Impact Check (see 3.5) to assess the relevance of the sustainability topic.
If no sustainability issue has been identified within the Check for Basic Sustainability Requirements, the solution's sustainability contribution is subsequently evaluated within the Check for Sustainability Value Contribution (see 3.6).

Figure 4: Check for Basic Sustainability Requirements



1) Substances classified as carcinogenic, mutagenic or toxic to reproduction (CMR) according to hazard categories 1A and 1B of the Harmonized Classification, Labelling and Packaging (CLP) Regulation
2) Substances classified as persistent, bioaccumulative and toxic (PBT) or very persistent and very bioaccumulative (vPvB) according to Annex XIII of REACH Regulation
3) Substances with confirmed equivalent level of concern (ELoC) to CMR or PBT/vPvB according to Article 57(f) of the REACH Regulation
4) According to REACH Use Descriptor System; solution intended for industrial, professional and/or consumer uses
5) Solution with potential release into the environment

Within the Check for Basic Sustainability Requirements, the following rules apply with regards to regional differences:

If a solution in its respective application fails to fulfill all stakeholder requirements in a specific region, this does not limit its performance assessment in other regions but would generally trigger a cross-check between the different regional assessments.
If a solution in its specific application fails to fulfill the corporate minimum requirement regarding (environmentally) hazardous substances for industrial, professional and/or consumer uses in a specific region, this solution in the same application may be evaluated at best as a Performer in any other region provided that the Risk Characterization Ratio (RCR) < 1.

3.4.1 Corporate Minimum Requirement: Compliance with BASF's Code of Conduct

BASF's Code of Conduct defines basic, globally applicable standards of conduct. It is a concise summary of legal and ethical principles, including fundamental international standards, local legislation, corporate policies and guidelines, that in many cases extend beyond applicable legal regulations.

Compliance with all legislation to protect humans and the environment is one of our basic tenets. This applies to our products as well as to our processes. BASF has been committed to the principles of Responsible Care since 1992. BASF's Responsible Care Management System comprises the global directives, standards and procedures for safety, security, health and environmental protection for the various stations along our value chain.

BASF is committed to upholding international labor and social standards, which we have embedded in our global Code of Conduct and embraced through our policy about "Respect for International Labor and Social Standards (ILSS)". This encompasses internationally recognized labor norms as stipulated in the United Nations' Universal Declaration of Human Rights, the OECD Guidelines for Multinational Enterprises, the International Labor Organization (ILO) and Tripartite Declaration of Principles Concerning Multinational Enterprises and Social Policy. Moreover, BASF actively supports the UN Global Compact, a voluntary initiative based on company commitments to implement universal sustainability principles and to advance UN goals such as the Sustainable Development Goals (SDGs). In addition to social standards, occupational health and safety is of utmost importance to BASF. The ultimate goal is to provide safe working conditions and to ensure that the manufacturing and use of BASF products is safe and poses no health risks to operators. In conformity with the principles of Responsible Care, BASF continuously aims at acting responsibly in order to protect all BASF employees, contractors, business partners and neighbors against hazards inherent in BASF's processes.

With regards to economic aspects, a plurality of national and international laws applies to BASF's Code of Conduct, including embargo and trade regulations, regulations on money laundering, competition law and anti-corruption legislation.

To fulfill the corporate minimum requirement of compliance with BASF's Code of Conduct, a solution and/or its manufacturing shall be in accordance with:

- all applicable laws and regulations on environmental protection as well as guidance provided under BASF's Responsible Care Management System
- BASF's corporate principles regarding social standards and occupational safety
- all applicable embargo and trade regulations, regulations on money laundering and corruption.

If there is any indication that the solution and/or its manufacturing violate any of the above, it will be subject to the Impact Check (see 3.5).

3.4.2 Corporate Minimum Requirement: Adequate Profitability

To support our long-term business success, solutions from the business portfolio shall contribute to the company's economic development.

To comply with the corporate minimum requirement, a solution of BASF's portfolio shall be profitable at present or in the foreseeable future. The decision as to whether a solution's profitability is appropriate is entrusted to the respective business division based on conditions in the market.

Within the decision-making process, the following exception shall be considered: a solution in the launch phase may not yet be sufficiently profitable. To pass the corporate minimum requirement, a solution shall, with a sufficient degree of likelihood, be profitable within a reasonable time frame after full-scale market introduction.

If a solution cannot make an appropriate contribution to BASF's economic development at present or in the foreseeable future, it shall undergo the Impact Check (see 3.5).

3.4.3 Corporate Minimum Requirement: Eco-toxicity Risk and Human Toxicity Risk in Sensitive Applications

We work continuously to ensure that our products pose no risk to people or the environment when they are used responsibly and in the manner intended.

Substances with carcinogenic, mutagenic or reprotoxic properties (CMR substances) are of specific concern to human health due to the irreversibility and seriousness of the effects they may cause. Regulation (EC) No 1272/2008 on the Classification, Labelling and Packaging of Substances and Mixtures (CLP Regulation) classifies substances into different categories (category 1A to 2) according to their hazard potential for human health. Substances in categories 1A and 1B of the CLP Regulation are particularly critical as there is sufficient evidence to determine that these substances are "known" or "presumed to be" carcinogenic, mutagenic or toxic to reproduction (see Appendix 1).

Besides CMR substances, substances which are (i) persistent, bioaccumulative and toxic (PBT) or very persistent and very bioaccumulative (vPvB) according to Annex XIII of Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH Regulation) or (ii) of a confirmed equivalent level of concern (ELoC) according to Article 57(f) of the REACH Regulation may also have serious effects on human health. The REACH Regulation classifies substances as PBT/vPvB based on their persistence, tendency to bioaccumulate and toxicity (see Appendix 2). When evaluating whether our products might pose a risk to human health, considering the involved substances is thus a crucial step.

However, a risk to human health cannot solely be determined by the substance properties. Whether a hazard materializes rather depends on whether contact with chemicals is possible. For evaluating the potential for human exposure, the intended uses of a substance must be taken into account. According to the REACH Use Descriptor System, the following main user groups can be distinguished:

- **Consumer use:** private households/general public, e.g. toys, cosmetics, food contact, cleaning agents, tensides, do-it-yourself products
- **Professional use:** public domain (administration, education, entertainment, services, craftsmen), e.g. painter, hairdresser, health & safety officer
- **Industrial use:** uses of substances as such, or in preparation at industrial sites (ECHA 2010).

If a solution which is intended for industrial, professional or consumer use with direct contact from the end user contains any

- CMR substance according to category 1A and 1B of the CLP Regulation
- PBT substance according to Annex XIII of the REACH Regulation, or
- confirmed ELoC substance according to Article 57(f) of the REACH Regulation

in a concentration greater than or equal to 0.1% weight by weight in the final product, the solution shall be subject to the Impact Check (see 3.5).

Substances which can create adverse effects on environmental organisms and ecosystems are of foremost concern from an environmental perspective. PBT, vPvB as well as confirmed ELoC substances are particularly problematic. However, the effects of the solution on the environment do not only depend on the (hazardous) properties of the respective substance but also to the extent of release in, or exposure to, the environment. Thus, environmental properties of the substances/solutions must be assessed only in the context of actual or potential exposure of the environment.

If a solution which is intended for an application with a potential release into the environment contains any

- PBT/vPvB substance according to Annex XIII of the REACH Regulation, or
- confirmed ELoC substance according to Article 57(f) of the REACH Regulation

in a concentration greater than or equal to 0.1% weight by weight in the final product, the solution shall be subject to the Impact Check (see 3.5).

Please note: In general, the CLP Regulation serves as basis for the identification of CMR substances. However, in case a solution's CMR categorization is higher in the region where the solution is sold than the European categorization, the respective national categorization forms the basis for the performance assessment. The same rule applies to substances categorized as PBT according to Annex XIII of the REACH Regulation. Besides the REACH Regulation, national regulatory schemes are implemented, sometimes using slightly different definitions and criteria for identifying PBT/vPvB properties. If a solution is sold in a country in which the legal framework concerning PBT/vPvB criteria is stricter than European law, the respective national regulation shall be taken as the basis for evaluation.

3.4.4 Stakeholder Requirement: Relevant Upcoming Regulations and Industry/Customer Specific Requirements

As well as complying with corporate values and (eco)-toxicological principles, a solution from BASF's portfolio is required to correspond to applicable stakeholder demands. Observing existing and upcoming legal regulations as well as customer or industry-specific requirements is of decisive importance to either remain competitive, gain a competitive advantage or successfully enter a market. In contrast to the corporate minimum requirements, the relevance of stakeholder specific demands for the portfolio

assessment is determined by the respective business division, after consulting with the corporate functions from EHS and Corporate Sustainability.
The applicability of industry-specific regulations and requirements varies by application and the geographic region a solution is marketed in. Implications of changing regional requirements and regulations in other regions of the world (spill-over effect) are to be taken into consideration for a comprehensive assessment.

Different bodies, such as regulatory authorities, international conventions, industrial associations, trade unions, consumer associations and key players in the value chain, publish lists of substances to avoid which may give indications on forthcoming industry-specific regulations.

Examples of such lists are:

- REACH Candidate List of Substances of Very High Concern for Authorization
- SIN (Substitute It Now!) List
- OSPAR list of chemicals of possible concern & priority action.

As well as complying with industry-specific upcoming regulations and requirements, the fulfillment of customer demands is of similar importance. BASF's wide-ranging portfolio of solutions is aimed at supporting customers by satisfying sustainability needs and providing solutions that meet end-consumer requirements both now and in the future. With growing public awareness of environmental issues, demands for eco-friendly solutions with an improved environmental compatibility are steadily on the rise. Responding to market requirements, BASF's customers increasingly call upon concentration thresholds below those defined by law, for example to conform with the requirements of environmental labels (e.g. Blue Angel eco-label) or to achieve their specific corporate environmental targets.

Please note: All upcoming regulations and industry/customer specific requirements which may lead to a behavioral change or action by relevant stakeholders at present or in the foreseeable future should generally be considered in the segmentation process.

To pass this stakeholder requirement, a solution in its specific application must comply with applicable upcoming regulations and customer and industry-specific requirements.

If a solution fails to meet such regulations and requirements, it shall be subject to the Impact Check (see 3.5).

3.4.5 Stakeholder Requirement: Reputational Risk

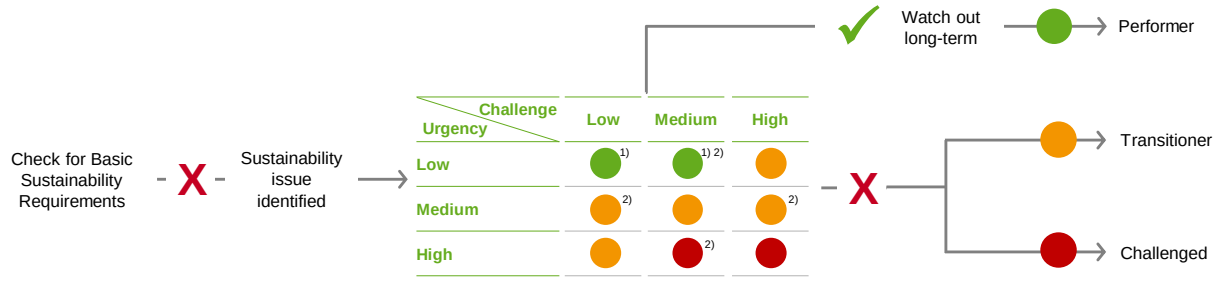
Despite compliance with legal, corporate and market/industry-specific requirements, a solution may face public rejection due to a specific sustainability topic. A solution affected by a sustainability topic for which there is a lack of acceptance among the general public harbors a reputational risk for BASF. The respective business units are asked to determine current or potential (foreseeable and upcoming) sustainability topics which are relevant for the sustainability performance assessment with the support of the EH&S, Corporate Communications and Corporate Sustainability divisions.

To pass this stakeholder requirement, a solution and its production process must not be exposed to reputational risks at present or in the foreseeable future.
If a solution and/or its production process entail a risk to the company's reputation, the solution shall be subject to the Impact Check (see 3.5).

3.5 Impact Check

If a sustainability topic has been identified within the Check for Basic Sustainability Requirements, the solution will subsequently be subject to the Impact Check. The relevance of the identified topic is judged by an urgency and a challenge assessment. Both categories are evaluated using a traffic light system (green, yellow, red).

Figure 5: Impact Check



1) No (market) relevant issue
2) Urgency is weighted higher in ambiguous cases

Urgency refers to the time span until/likelihood that a risk materializes:

- Low: No (time) pressure to solve the sustainability topic
- Medium: Medium (time) pressure to solve the sustainability issue
- High: High (time) pressure to solve the sustainability issue.

Challenge refers to the internal opportunities to mitigate the identified sustainability issue:

- Low: No mitigation measures needed or measures internally practicable with low effort
- Medium: Mitigation measures moderate (ranging from flagging of products to Product Stewardship up to substitution)
- High: Mitigation measures critical, significant effort needed (e.g. R&D).

The average of both categories is determined under consideration that urgency is weighted higher than challenge in ambiguous cases.

A solution marked by a green light is sorted into the Performer category showing that the evaluation of the identified sustainability topic has not resulted in any (market) relevant impacts in the foreseeable future. BASF uses the green marking as an early awareness for internal reasons.

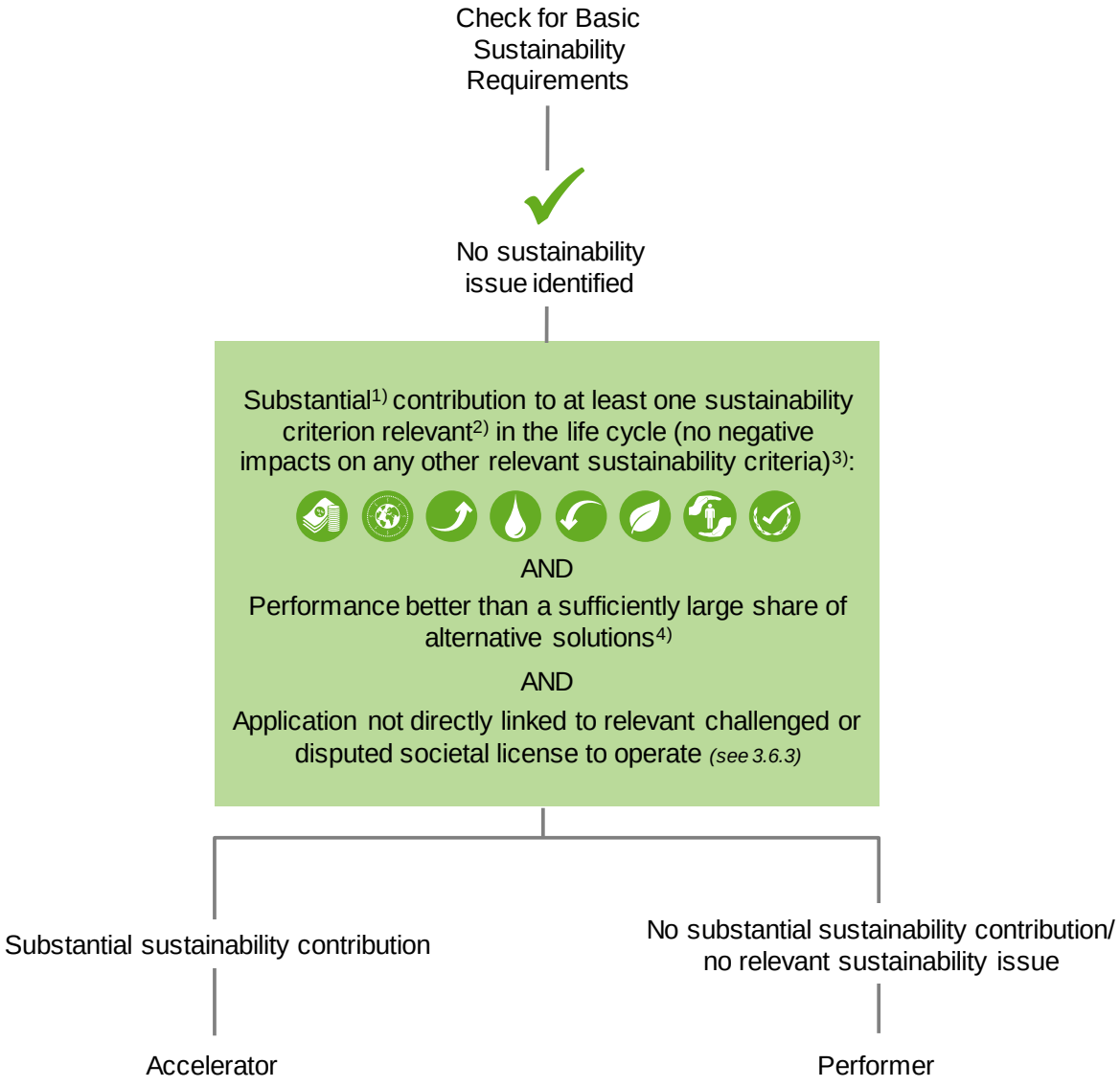
A solution marked by a yellow light is sorted into the Transitioner category indicating that the specific sustainability issue is actively being addressed and may be remedied in the foreseeable future.

A solution marked by a red light is assessed as Challenged indicating high urgency paired with a medium or major challenge in terms of remediation.

3.6 Check for Sustainability Value Contribution

Solutions with no sustainability issues are subject to the Check for Sustainability Value Contribution. Within the check, the significance of the solution's sustainability contribution and the competitive environment are taken into consideration.

Figure 6: Check for Sustainability Value Contribution



1) Substantial: solution's performance is essential for enabling the sustainability benefit in the life cycle
2) Relevant: addressing a sustainability issue that is reasonably considered important in the life cycle
3) Sustainability criteria from left to right: Cost savings downstream, Climate change and energy, Resource efficiency, Water, Emission reduction (air, noise, soil), Biodiversity and renewables, Health and safety, Hunger and poverty (see 3.6.1)
4) As a guidance: combined market share of poorer alternative solutions ≥ 20% based on sales volume

To attribute a sustainable development contribution to a solution and categorize it as an Accelerator, the following conditions shall be fulfilled (see 3.6.1 to 3.6.3):

3.6.1 Substantial Contribution to Sustainability Criteria

Regarding the first condition, the solution shall make a substantial contribution to at least one sustainability criterion of relevance in the value chain, while simultaneously having no significant negative impacts on any other relevant sustainability criterion.
The following eight sustainability criteria are defined, based on the outcome of BASF's materiality analysis undertaken in 2010 (for details see Appendix 3):

Sustainability pillar	Sustainability criterion	Solution description (exemplary)	Sustainability icon
Economy	**Cost savings downstream**	■ Enables cost savings downstream	**Cost savings** 
Ecology	**Biodiversity and renewables**	■ Enables conservation of biodiversity ■ With improved eco tox profile ■ Based on sustainably sourced renewable raw materials ■ Enables the use of sustainably produced renewable raw materials	**Biodiversity**  **Renewables** 
	Climate change and energy	■ With reduced carbon footprint in production ■ Enables greenhouse gas savings downstream ■ With reduced energy consumption in production ■ Enables energy savings downstream	**Climate change**  **Energy** 
	Emission reduction (air, noise, soil)	■ With reduced air pollutant emissions in production ■ Enables a reduction of air pollutants ■ Enables noise reduction ■ With reduced noise pollution in production ■ Enables a reduction of soil contaminants	**Emissions**  **Biodegradability** 
	Resource efficiency	■ Enables resource savings ■ Enables improved production yield downstream ■ Incorporates recycled content	**Resource efficiency** 

Sustainability pillar	Sustainability criterion	Solution description (exemplary)	Sustainability icon
	Resource efficiency (cont.)	■ Enables reduction, reuse or recycling of waste ■ Enables prolonged life span of the final product	**Waste reduction**  **Durability** 
Ecology (cont.)	**Water**	■ Enables reduction of emissions into water ■ Enables water savings downstream ■ With improved aqua tox profile ■ With reduced water footprint in production ■ Enables water treatment and drinking water purification	**Water** 
Society	**Health and safety**	■ With improved human tox profile ■ Enables safer handling and use of chemical substances ■ Enables improved protection of worker health ■ Enables improved protection of public health ■ Enables reduction of nutrition deficiencies	**Health and safety** 
	Hunger and poverty	**With focus on the advancement of developing countries** ■ Achieves food security and/or improves nutrition ■ Enables affordable housing ■ Improves sanitation ■ Helps reduce poverty	**Hunger and poverty** 
	Additional market-specific criterion (optional)		

Please note:

- A solution may contribute to several sustainability criteria.
- If a solution contributes exclusively to the sustainability criterion “cost savings downstream”, the solution shall be categorized as a Performer.
- The contribution to a sustainability criterion can take place at any stage in the solution’s life cycle.

A contribution is generally regarded as substantial if it is essential for enabling the sustainability benefit in the life cycle. A sustainability criterion is generally considered relevant if it addresses a sustainability issue that may reasonably be considered important in the solution's life cycle. If a solution has significant negative impacts in at least one relevant sustainability criterion along the value chain, the solution must not be assessed as an Accelerator but as a Performer. A negative impact is generally considered as significant if the negative effect outweighs the solution's positive sustainability contribution. In case of uncertainties concerning trade-offs, a Life Cycle Assessment (e.g. Eco-Efficiency Analysis) may help quantify benefits and harms.

3.6.2 Performance Better than a Sufficiently Large Share of Alternative Solutions

The second condition to be fulfilled to categorize a solution as an Accelerator is that the solution's sustainability contribution is better than that of a sufficiently large share of alternative solutions or the non-use of the solution. The market environment should be taken into consideration for the evaluation of the "sufficiently large" criterion. In any case, the share of alternative solutions will generally be deemed as sufficiently large if the combined market share is greater than or equal to 20 percent in the reference market based on sales volume.

Please note: The aim of the second condition is to prevent a solution which tackles a sustainability issue that is no longer perceived as such by the public (e.g. due to legal regulations or market environment) or which has been on the market for a long time, being assessed as an Accelerator.

3.6.3 Limitation to the Assessment of Accelerators

A solution which is intended for an application that is directly linked to a relevant challenged or disputed societal license to operate, is recommended not to be categorized as an Accelerator but as a Performer. Proposals for such kind of applications can be made by the responsible business divisions or Corporate Sustainability, while the final decision shall be taken by Corporate Sustainability.

4. Sustainable Solution Steering Key Processes in a Nutshell

The segmentation of the business portfolio is conducted in a workshop format. A briefing session and a preparatory phase precede a challenging session. The sustainability performance evaluation of solutions in their specific applications and regions is based on the expert judgement of a range of responsibilities, supported by scientific data, if available. The representatives of the Corporate Sustainability assume a leading role in challenging the assessment by the responsible business division and assuring consistency across all business divisions.

The composition of the participants involved in the segmentation process depends on the focus of the responsible business division (product vs. process orientation) and its regional structure (regional vs.

global). In general, the following responsibilities and/or expertise are eligible for involvement (depending on companies' structure and organization):

Function	Expertise
Corporate Sustainability	Method owner, cross business division view, cross market- and region sustainability expertise
Sustainability Manager of Business Division	Sustainability knowledge of the division and its markets
Product Steward of Business Division	Product-specific ecological, toxicological, regulatory and stakeholder knowledge
Marketing Business Division	Expertise on product performance, mid-term and long-term business division strategy and economical figures, market overview
Controlling of Business Division*	Mid-term and long-term business division strategy and economical figures
Product Management of Business Division*	Development and management of portfolio including production and procurement expertise
Procurement*	Expertise in topics related to procurement of raw materials
Research and Development*	Expertise on development of new products or improvements
Corporate Product Safety*	Expertise on corporate sustainability concerns regarding (eco-)toxicity
Regional Representative*	Expertise on regional market requirements, portfolio, regulations and customer requests

*if required

4.1 Kick-off and Briefing Session

To gain the full support of the management and the participants involved in the segmentation process and to ensure a common understanding of the methodology, in most cases the Sustainable Solution Steering process starts for each business division with a kick-off meeting including briefing session.

Prior to the meeting, the Sustainable Solution Steering approach for the individual business division including scope and timeframe is defined by the Sustainability Manager of the respective business division and the Corporate Sustainability representative.

After the briefing session, the Sustainable Solution Steering briefing document is provided to all participants and the workshop team starts with the initial segmentation (in case of very fist segmentation)/portfolio review (review of already assessed solutions) while taking the defined criteria of

the Check for Basic Sustainability Requirements and Check for Sustainability Value Contribution into account. To do so, the Corporate Sustainability representative provides a prepared Sustainable Solution Steering spreadsheet to the Sustainability Manager of the business division, who in turn sets up a workshop date. The document includes product and financial information, such as product name, current 3rd party sales, ideally expected 3rd party sales and information on the market segment and area of application.

4.2 Preparation of Challenging Session

In the period between briefing session and challenging session, the business division representatives and the Product Steward in particular perform the initial portfolio evaluation/portfolio review.

The evaluation/review serves as the basis for the challenging session. The preparatory phase is therefore essential to conduct the subsequent workshop session in an efficient manner. Based on the decisions taken in 4.1, the challenging session shall be organized. All relevant functions are invited to the workshop session to ensure that all aspects are discussed and decided within the session.

4.3 Challenging Session

Following the preparatory phase, the (initial) portfolio assessment/review is challenged by representatives of the Corporate Sustainability during the workshop session (face-to-face or web-based meeting).

Ideally, the challenging session is conducted by two representatives from Corporate Sustainability. Ideally, of the two representatives, one has expert knowledge on the business division with the other member providing knowledge on the business specific value chains. As a rule, the challenging session is carried out within a cross-functional workshop framework.

During the workshop session, the Corporate Sustainability representatives challenge the initial/reviewed portfolio evaluation conducted by the business division. During a joint discussion, the sustainability categorization of each solution is reviewed successively, with the defined segmentation criteria being taken into account. As well as scrutinizing the rationale behind each solution segmentation, the defined Accelerator benchmarks and mitigation actions for Challenged, including action owner and due date shall be reviewed and challenged by Corporate Sustainability.

Modifications to the portfolio assessment during the challenging session shall be documented in the Excel spreadsheet by Corporate Sustainability. If no agreement on the categorization is reached, the Corporate Sustainability representative has the final decision-making authority.

4.4 Final Presentation and Documentation

After the portfolio assessment, the segmentation results are finalized, documented and prepared for the final management report. The Corporate Sustainability representative will develop a tailor-made plan for progression in collaboration with the business division representatives.
This entails defining measures and milestones for Accelerators and Challenged solutions as well as the finalization of the Sustainable Solution Steering standard report, which consists of the following three documents:

- Evaluation spreadsheet
- Sustainable Solution Steering Workshop Report including Action Plans for all identified Challenged solutions
- Sustainable Solution Steering Executive Summary including the overview of the segmentation result (share per Sustainable Solution Steering category), measures and milestones as well as strengths and weaknesses.

5. Sustainable Solution Steering Business Approach

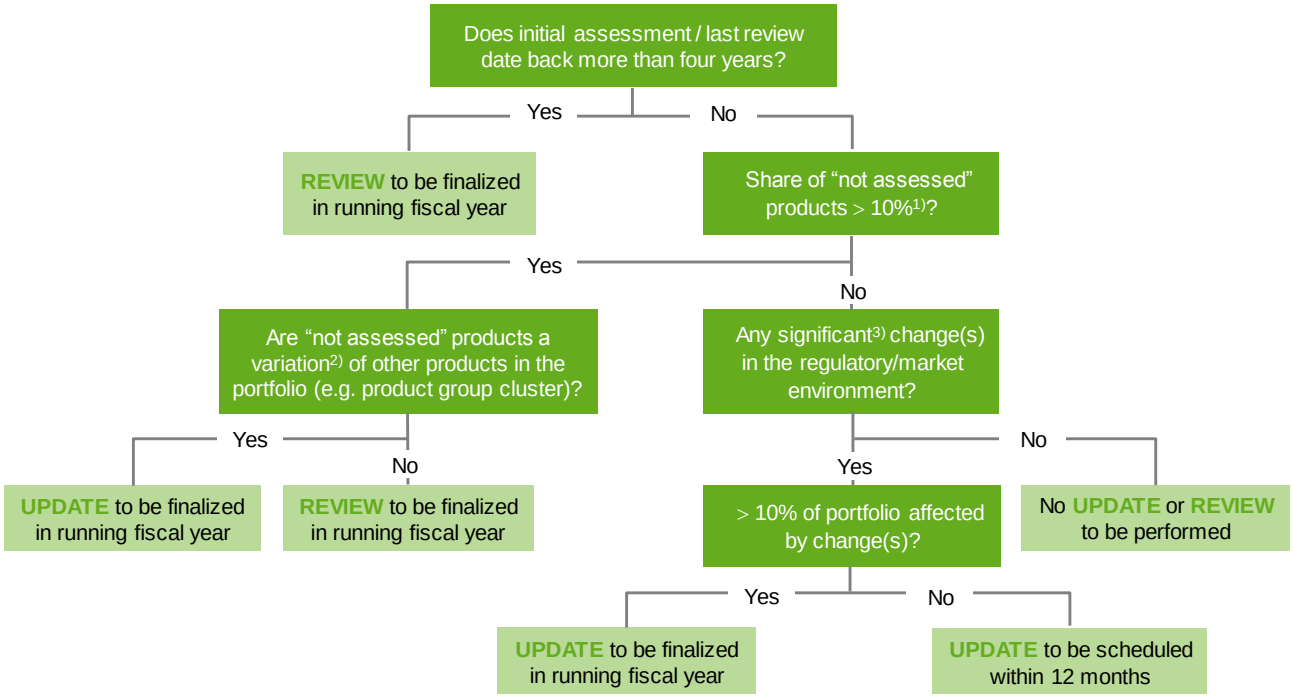
Since 2013, Sustainable Solution Steering allows the evaluation, interpretation and segmentation of the business portfolio on a regular basis.
Every year, a sales update shall be performed and be included in the annual controlling report (e.g. Strategic Controlling Report). It is also possible to use the tool during the regular portfolio management every year if desired by the responsible business division.
A review of the categorization of the portfolio shall be done at least every five years which includes the check of the entire portfolio in a workshop format. Exceptional prolongation of this review period (e.g. business division's strategy development is upcoming or in process, structural changes) needs to be discussed and confirmed by the Corporate Sustainability division to ensure a portfolio steering according BASF's strategic path to a more sustainable solutions portfolio.

In general, a distinction shall be made between an update and a review:

Update: Performed on a case-by-case basis, assessment of selected products, performed by the Sustainability Manager of business division and other functions if required (e.g. Product Stewardship, R&D, Marketing and Controlling, optional involvement of Corporate Sustainability).

Review: Performed on a regular basis, assessment of entire portfolio, obligatory involvement of the following functions: Product Stewardship, Marketing, Sustainability Manager of business division, Corporate Sustainability.

Figure 7: Portfolio Update and Review Cycle



1) E.g. in case of acquisition
2) Remark: no reason to suppose that the sustainability category may negatively or positively differ e.g. due to ingredients
3) E.g. sunset date published for a substance, break-through innovation of competitors

Frequently Asked Questions (FAQs): Sustainable Solution Steering

Questions	Answers
Is it possible to use the Sustainable Solution Steering method also in non-chemical industries?	The method can be used in other industries as well. Some parts of the method, as well as parts of the process, may need to be adapted with regards to content, particularly at the Check for Basic Sustainability Requirements. However, we know that Sustainable Solution Steering has already been used in other industries, e.g. food, nutrition, pharmaceutical.
There seems to be a significant effort to assess all products in their applications and markets. How can it be managed without using too many own resources?	Particularly during the first segmentation of an entire portfolio, management needs to commit to the provision of internal resources from various functions to run the segmentation process. However, we have also had positive experiences when contracting a consultant, supporting in e.g. preparation work, data handling, method controlling, reporting and organizing industry and market background information.
Four years ago, BASF published for the first time the results of the assessment of its sales products using this method. What will happen with products coming from R&D or even with current R&D projects?	Innovative solutions from R&D are essential for BASF's long-term success. Therefore, we also consider R&D solutions in our assessments. To enhance our R&D projects' contribution to a more sustainable sales product portfolio, we integrated the Sustainable Solution Steering method also into our R&D innovation processes.
A large amount of data must be managed during the portfolio segmentation for a whole company. How does it work?	At BASF, we have a very high number of product applications and therefore an enormous amount of data. Sustainable Solution Steering at BASF is handled in two ways. For the challenging workshop, we use product lists. As basis for target setting, monitoring and business support, we linked our database with standard IT solutions available in the market.

Is this a standard or widely accepted method?	Some of our peers have developed their own methods and communicate their overall contribution to product sustainability using their set of criteria. In 2018, the World Business Council for Sustainable Development (WBCSD) published the Chemical Industry Methodology for Portfolio Sustainability Assessments (PSA) which addresses the topic of proactively steering a product portfolio. One aim of the methodology is to improve consistency in communication within the industry. BASF contributed significantly to develop the WBCSD methodology. In 2012, we developed our own method for sustainability portfolio management called Sustainable Solution Steering. Our method is in line with the methodology published by the WBCSD in 2018.
Sourcing sustainable raw materials is gaining importance. Is Sustainable Solution Steering a method for securing the upstream value chain?	The Sustainable Solution Steering method can be used to assess raw materials and their alternatives which a company purchases from various sources. However, the method cannot replace or substitute in-depth personal audits at suppliers or scientific life cycle analysis assessing carbon or water footprints.

Appendix 1:
CMR 1A and 1B criteria according to CLP Regulation

Carcinogens, hazard categories 1A and 1B

Category 1A: Category 1A, known to have carcinogenic potential for humans, classification is largely based on human evidence, or

Category 1B: Category 1B, presumed to have carcinogenic potential for humans, classification is largely based on animal evidence.

Germ cell mutagens, hazard categories 1A and 1B

Category 1A: The classification in Category 1A is based on positive evidence from human epidemiological studies.
Substances to be regarded as if they induce heritable mutations in the germ cells of humans.

Category 1B: The classification in Category 1B is based on:

- positive result(s) from in vivo heritable germ cell mutagenicity tests in mammals; or
- positive result(s) from in vivo somatic cell mutagenicity tests in mammals, in combination with some evidence that the substances have potential to cause mutations to germ cells. It is possible to derive this supporting evidence from mutagenicity/genotoxicity tests in germ cells in vivo, or by demonstrating the ability of the substance or its metabolite(s) to interact with the genetic material of germ cells; or
- positive results from tests showing mutagenic effects in the germ cells of humans, without demonstration of transmission to progeny; for example, an increase in the frequency of aneuploidy in sperm cells of exposed people.

Reproductive toxicants, hazard categories 1A and 1B

Category 1A: Known human reproductive toxicant
The classification of a substance in Category 1A is largely based on evidence from humans.

Category 1B: Presumed human reproductive toxicant
The classification of a substance in Category 1B is largely based on data from animal studies. Such data shall provide clear evidence of an adverse effect on sexual

function and fertility or on development in the absence of other toxic effects, or if occurring together with other toxic effects the adverse effect on reproduction is considered not to be a secondary non-specific consequence of other toxic effects. However, when there is mechanistic information that raises doubt about the relevance of the effect for humans, classification in Category 2 may be more appropriate.

Appendix 2:
PBT and vPvB criteria according to Annex XIII of REACH Regulation

PBT substances

Persistence:	■ the degradation half-life in marine water is higher than 60 days ■ the degradation half-life in fresh or estuarine water is higher than 40 days ■ the degradation half-life in marine sediment is higher than 180 days ■ the degradation half-life in fresh or estuarine water sediment is higher than 120 days ■ the degradation half-life in soil is higher than 120 days
Bioaccumulation:	■ bioconcentration factor in aquatic species is higher than 2.000
Toxicity:	■ the long-term no-observed effect concentration (NOEC) or EC10 for marine or freshwater organisms is less than 0,01 mg/l ■ the substance meets the criteria for classification as carcinogenic (category 1A or 1B), germ cell mutagenic (category 1A or 1B), or toxic for reproduction (category 1A, 1B, or 2) according to regulation EC No 1272/2008 ■ there is other evidence of chronic toxicity, as identified by the substance meeting the criteria for classification: specific target organ toxicity after repeated exposure (STOT RE category 1 or 2) according to regulation EC No 1272/2008

vPvB substances

Persistence:	■ the degradation half-life in marine, fresh or estuarine water is higher than 60 days ■ the degradation half-life in marine, fresh or estuarine water sediment is higher than 180 days ■ the degradation half-life in soil is higher than 180 days
Bioaccumulation:	■ bioconcentration factor in aquatic species is higher than 5.000

Appendix 3:
Materiality Analysis

In 2010, a materiality analysis was conducted to identify environmental, social and governance issues of high relevance for society and BASF. Based on the evaluation of more than 300 stakeholders, including representatives from academia, non-governmental organizations, customers, corporate managers and BASF's Sustainability Council, 44 important issues were initially identified. In a further step, the identified issues were positioned in the materiality matrix according to their strategic importance for stakeholders and BASF's business. Seven sustainability priority issues which are most important for stakeholders and BASF were identified: energy and climate, water, renewable resources, product stewardship, human capital development, human and labor rights and biodiversity.
These issues provided the foundation for defining the sustainability criteria of the Check for Sustainability Value Contribution.

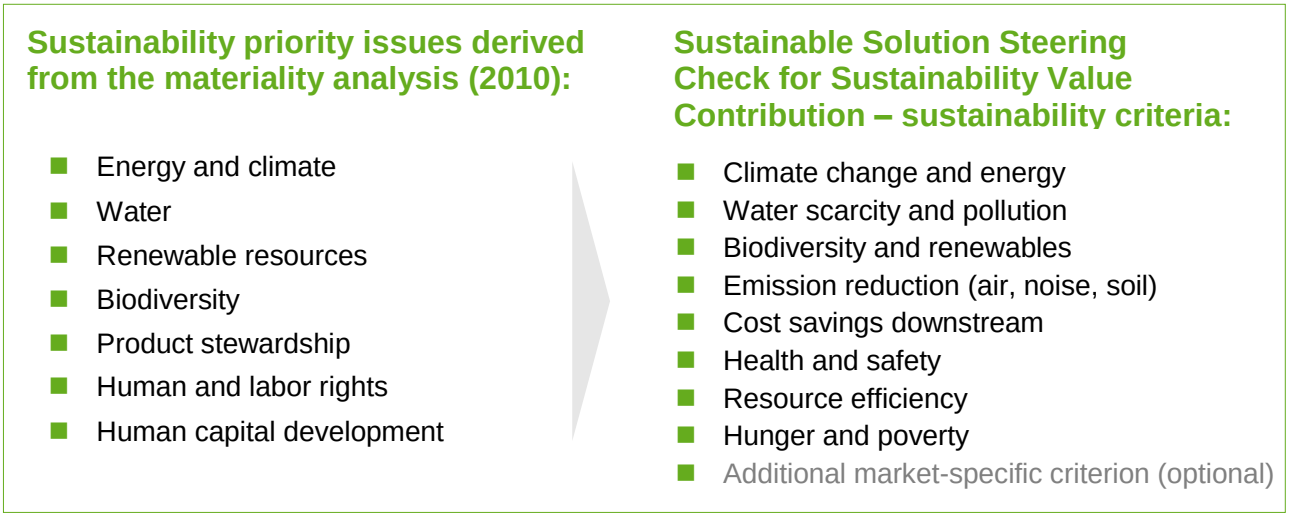
Although all three dimensions of sustainability are reflected within the materiality analysis, the social and ecological dimensions are addressed directly, whereas the economic dimension is approached indirectly. As a result, none of the defined priority issues has a direct connection to the economic dimension.
Furthermore, unlike Sustainable Solution Steering, the identified sustainability priority issues are not focused on individual product or process solutions, but rather on the strategic relevance for BASF and its stakeholders. Consequently, the sustainability priority issue of "human capital development" is not applicable to the Sustainable Solution Steering methodology.

The sustainability priority issues are translated as follows:

- "Energy and climate" corresponds to the sustainability criterion "climate change and energy"
- "Water" is reflected in the sustainability criterion "water scarcity and pollution"
- "Renewable resources" and "biodiversity" are represented in the Sustainable Solution Steering sustainability criteria "biodiversity and renewables" and "emission reduction (air, noise, soil)"
- "Product stewardship" and aspects of "human and labor rights" are both reflected in the sustainability criterion "health and safety"
- "Resource efficiency" was supplemented to outline solutions contributing to resource savings
- The economic dimension is considered in the sustainability criterion "cost savings downstream"
- At the UN summit in September 2015, the United Nations have announced the SDGs. A comparison between the existing sustainability criteria and the SDGs showed a high coverage, yet the sustainability criterion "hunger and poverty" was supplemented to outline solutions' contributing to the advancement of developing countries. This criterion replaced the former sustainability criterion "UN Millennium Development Goals".

One additional market-specific criterion may be added to the given set of sustainability criteria to allow for consideration of upcoming sustainability topics and/or for individual business division specifications.

Figure 8: Derivation of the Sustainable Solution Steering Sustainability Criteria



In 2013, the materiality analysis was updated. The following eight material aspects were identified for BASF based on the results of the stakeholder survey and internal workshops: Energy & Climate, Water, Resources & Ecosystems, Operational Excellence, Products & Solutions, Responsible Partnering, Employment & Employability, and Food. A review of the material aspects in 2013 led to the conclusion that these aspects are in accordance with the sustainability criteria of the Sustainable Solution Steering methodology.

A strategic evaluation process in 2015 and 2016 built upon this materiality analysis from 2013 to define new focus topics along the value chain. It provides strategic orientation for BASF's corporate commitments along the value chain:

- We source responsibly.
- We produce safely for people and the environment.
- We produce efficiently.
- We value people and treat them with respect.
- We drive sustainable solutions.

Relevant topics resulting from these commitments, such as supply chain responsibility, responsible production, resource efficiency, energy and climate protection, water, product stewardship, employment and employability, and portfolio management are all still the basis for integrating these topics into our long-term steering processes to ensure our societal license to operate and take advantage of business opportunities.

We create chemistry

BASF SE
Sustainability Strategy

67056 Ludwigshafen, Germany
sustainability-strategy@basf.com
www.basf.com/sustainability