



**SAFE** BY  
**DESIGN**

**TAKE CARE OF THE FUTURE**



## **A safe future starts now**

**Imagine a clean and safe world. With safe products, materials and processes, without risks for people or the environment. Today, tomorrow and beyond. We can achieve this by including safety from the very beginning of product and process development: Safe-by-Design.**

## **Early identification of risks**

Substances, materials and products have been developed in the past that created (and are still creating) problems to the environment and human health. Plastic and asbestos are two examples. We have to prevent this from happening again. To do so we need to design materials, products and processes that throughout their entire lifecycle do not cause harmful emissions or pose risks to human health and the environment anymore. We can achieve this by making safety a design requirement. It is precisely at that stage that crucial choices are made about raw materials, basic techniques and applications, while there is still time to make adjustments.

## Come on board!

Of course safety is important to you. Risk assessment for human health and the environment is part of your job. Obviously. Not only the short-term risks, but also the long-term risks. After all, it's better to be safe than sorry. And you want your children and grandchildren to enjoy a clean, healthy and safe living environment. We are looking for frontrunners to jointly develop the concept of Safe-by-Design. People like you. Sign up now! Visit [safe-by-design-nl.nl](http://safe-by-design-nl.nl) for more information.

## Why Safe-by-Design?

**New technologies are developing rapidly. Biotechnology and nanotechnology open up opportunities for innovation in areas as diverse as healthcare, energy supply, construction and industrial production, plus a range of possibilities for precision agriculture, medicine and pest control. Technological progress is also leading to a tremendous boost of the rate of innovation in the chemical industry.**

But what are the consequences of all these new technological developments and applications? Their possible unintended consequences are sometimes difficult to foresee. For example, the risks to human health and the environment of new nanomaterials and chemical substances that are currently entering the market, cannot be properly assessed yet. Although laws and regulations are in place, it is better to prevent risks by thinking about safety for human health and the environment at the very beginning, in the design phase.

### Towards a new safety culture

Safe-by-Design means that the safety of substances, materials, products and processes for human health and the environment are already included in the design phase. This requires a new kind of safety awareness among scientists and process and product developers, but also on the part of the management of companies, since they make the investment decisions. A distinct aim of manufacturers should be to design in such a way that no harmful effects occur to human health and the environment throughout the whole product lifecycle. In this way, safety becomes an integral part of the entire process of research and innovation, assisting manufacturers to avoid problems that may arise later on in the process. This calls for a shift in culture. Safe-by-Design requires a different mindset that focuses on interdisciplinary collaboration, and on safety as an essential requirement for technological design.



### **SafeChassis: new, safer micro-organisms**

In the SafeChassis project, researchers from Wageningen University & Research apply Safe-by-Design to synthetic biology, a branch of modern biotechnology in which properties of micro-organisms are radically altered. In SafeChassis researchers are trying to modify a bacterium, *Pseudomonas putida*, so that it can help to synthesize various products, from biofuels to pharmaceuticals. Safety risks are avoided by redesigning the bacterium in such a way that it can only survive under certain controlled conditions.

### **Making every innovation Safe-by-Design**

Particularly with new products and designs with new possibilities and functions, such as nanomaterials and biotechnological products, it is useful to apply Safe-by-Design to prevent any subsequent environmental and health problems. SafeChassis (see box) is an example. Safe-by-Design is also important when replacing existing chemicals and processes. For example, the EU is developing a strategy aimed at creating a non-toxic environment. Toxic substances will be replaced as much as possible by non-toxic or less toxic alternatives, which may need to be newly developed. In the chemical process industry, the risks of incidents can be reduced to nearly non-existent, by designing installations in a fundamentally different way.

### **Sustainable and circular**

Safe-by-Design is a precondition for the circular economy. A sustainable design is a safe design. Everywhere, now and in the future. The intended reuse of substances and materials makes Safe-by-Design an essential part of Circular Design. Ruud Balkenende, professor of Circular Product Design at Delft University of Technology, describes safety as an indispensable element of the circular economy: "Environmental quality is at the core of circular design and environmental safety is an integral element. First of all, by avoiding risks in the use phase of a product. If something fails abruptly, this not only shortens the life span, but can also create risks for human health and the environment. Toxic materials make reuse difficult, and designers need to be aware of this. Besides the environmental aspect, safety is therefore a vital area of attention in circular design."

# Collaboration

State Secretary Stientje van Veldhoven emphasises the importance of cooperation with companies: "I am looking for frontrunner companies, companies that have technology and innovation high on their agenda and are committed to Responsible Research and Innovation. With these companies, I want to initiate joint activities (pilots/demonstration projects) which are aimed at further developing and operationalising Safe-by-Design."



## Benefits of Safe-by-Design

Through the development of safer products and processes, Safe-by-Design clearly provides benefits and advantages for society. However, this safety approach also offers benefits to businesses. With Safe-by-Design, manufacturers can further shape and develop their social responsibility. This offers advantages from both a moral and an economic point of view. Moreover, there is less likelihood of problems arising later on, which reduces potential liability for damage or the need for remediation, with the considerable (financial) consequences that this can entail.

## Challenges

Safe-by-Design requires a specific approach to technological design: it is an iterative, interactive, interdisciplinary process that includes safety as the key requirement during the design and development process. This requires close collaboration between specialists with specific areas of expertise, such as technology, toxicology and process and product development. It also requires new skills in the field of toxicology, design thinking and interdisciplinary collaboration, which, in turn, requires innovative, design-oriented education. Additionally, research is needed to acquire reliable information about risks for human health and the environment. Explorations in the context of nanotechnology have shown that more technical and scientific knowledge is needed to assess safety at an early stage of product design. Research is needed into new risk assessment strategies and methods. For that reason, the Netherlands plays an active role in European initiatives on nanotechnology and Safe-by-Design.

Participants in these initiatives focus, among other things, on the development of validated and standardised test methods.

## Opportunities

Companies, educational institutions and researchers that focus on Safe-by-Design are among the frontrunners in sustainable and circular business, socially relevant education, innovation, risk policy and safety. They are multidisciplinary and benefit from the exchange of knowledge and experience about responsible innovation, with each other and also with the authorities, nationally and internationally. Moreover, they take on board a mindset that pays for itself in many ways.

## Wanted: Frontrunners!

Safe-by-Design is a way forward in safety-thinking that still requires more development. We would like to do this together with parties that have a hands-on approach to innovation processes. Leading companies, research institutes and educational institutions. Partners who are working on or want to work on Responsible Research and Innovation, environmentally aware frontrunners who want to brainstorm with us on shaping Safe-by-Design together, and who wish to have a mutual exchange of knowledge and experiences: how can the government help companies with Safe-by-Design?. Are you or do you know such a frontrunner? Let us know!

## Want to know more or come on board?

For more information visit [www.safe-by-design-nl.nl](http://www.safe-by-design-nl.nl) or send an email to [safebydesign@minienw.nl](mailto:safebydesign@minienw.nl)

