

The logo for CHEMIE 3, featuring the word "CHEMIE" in a bold, black, sans-serif font, followed by a large, stylized number "3" in blue with a red outline.

THE SUSTAINABILITY INITIATIVE OF THE
GERMAN CHEMICAL INDUSTRY

A large, abstract graphic composed of several overlapping, curved bands in shades of red, blue, yellow, and light blue, creating a sense of movement and depth. The bands are layered, with some appearing in front of others, and they curve around a central white space.

AMBITIONS. ACHIEVEMENTS. SOLUTIONS.
Sustainability in the Chemical Industry in Germany

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WORKING TOGETHER FOR A SUSTAINABLE FUTURE

EMPLOYERS. EMPLOYEES. SOCIAL PARTNERSHIP
EMPLOYERS. EMPLOYEES. SOCIAL PARTNERSHIP

ECONOMY. ENVIRONMENT. SOCIAL EQUITY
ECONOMY. ENVIRONMENT. SOCIAL EQUITY

FOR GERMANY. FOR EUROPE. FOR THE WORLD
FOR GERMANY. FOR EUROPE. FOR THE WORLD



LISTENING. UNDERSTANDING. TAKING ACTION
LISTENING. UNDERSTANDING. TAKING ACTION

TODAY. TOMORROW. AND TOMORROW
TODAY. TOMORROW. AND TOMORROW

BUSINESS. POLITICS. SOCIETY
BUSINESS. POLITICS. SOCIETY



GERMAN CHEMICAL INDUSTRY ASSOCIATION (VCI):

The VCI represents the politico-economic interests of more than 1,700 German chemical companies and German subsidiaries of foreign businesses. For this purpose, the VCI is in contact with politicians, public authorities, other industries, the scientific community, and the media.

The VCI stands for over 90 percent of the chemical industry in Germany. In 2011 the German chemical industry realised sales of more than 184 billion euros and employed more than 428,000 people.

MINING, CHEMICAL AND ENERGY INDUSTRIAL UNION (IG BCE):

The IG BCE (Mining, Chemical and Energy Industrial Union) has a total of 680,000 members. It represents workers from the sectors of mining, chemicals, gas, glass, rubber, ceramics, plastics, leather, mineral oil, paper and pulp, environmental matters/recycling, coal, and the water industry. As an independent organisation with no affiliation to any political party or other social institution, IG BCE seeks critical but constructive exchanges with employers, politicians and the government.

GERMAN FEDERATION OF CHEMICAL EMPLOYERS' ASSOCIATIONS (BAVC):

BAVC is the German Federation of Chemical Employers' Associations and the umbrella organization in charge of collective bargaining and social policies within the chemical and pharmaceutical industry and large parts of the plastics processing and rubber industries. It represents the interests of its 10 regional member associations with 1,900 companies and 550,000 employees in dealings with trade unions, government bodies and the general public.

As the third-largest sector, the chemical industry is a major pillar of Germany's industrial base. The chemical industry includes the following sub-sectors: organic and inorganic base materials; fine and specialty chemicals, such as paints and coatings or plant protection products; plastics and the manufacturing of plastic goods; pharmaceuticals and active pharmaceutical ingredients; and consumer products such as adhesives, household detergents and cleaners, and cosmetics.

IN TRILOGUE

WHAT THE GERMAN CHEMICAL INDUSTRY AIMS TO SET IN MOTION

An interview with the steering committee members of the sustainability initiative Chemie³ (Chemistry³) – Margret Suckale (President of BAVC), Dr. Karl-Ludwig Kley (President of VCI) and Michael Vassiliadis (Chairman of IG BCE) – about how the initiative sees itself and what its goals are.

Here we have the employers' federation, the union and the industry association, all sitting together and presenting a joint sustainability initiative. Is everything in the chemical industry really as harmonious as it seems?

Kley: All of us here at this table have one common goal: We want the chemical industry to continue to be a pillar of a strong German industrial base that creates value and offers attractive jobs. To achieve that, we have to find solutions to address the changes in our business, societal and political environment. The keyword is sustainability; in other words, a long-term perspective that aims for sustainable development rather than short-term effects. To succeed, management and employees have to engage in this endeavour together. This is why our three organisations have formed an alliance to move ahead. This is no 'warm and fuzzy' initiative, but an important future perspective for the industry.

Suckale: It goes without saying that we don't always see things the same way. But we all take an objective approach because we are all aware of our shared responsibility for the jobs in our industry and its future. The Chemie³ sustainability initiative is a good example of this. In Germany, with our social

partnership we lead such efforts. We have a well-established basis of mutual trust.

Vassiliadis: For us, it is not a question of harmony or conflict, but of getting results. That's the essence of our alliance. A growing world population inevitably brings a growing demand for energy, raw materials, food, health care and mobility. At the same time, climate change, the limited regeneration capabilities of ecosystems, and the scarcity of raw materials all mean that we have to take a responsible approach to natural resources and use them wisely. And not least, there are already millions of people today looking for decent jobs. If we want to master these challenges, we need an industry that thinks in terms of solutions – and one that creates them as well.

And do you actually create solutions?

Kley: You could say that we are in pole position in this respect. We are one of the most important innovation drivers for sustainable development: Without products from the German chemical and pharmaceutical industries there would be no solar panels, no batteries for electric cars or energy-efficient TVs. At the same time, solutions like these are the basis for our economic success and



Dr. Karl-Ludwig Kley
President of VCI



Michael Vassiliadis
Chairman of IG BCE



Margret Suckale
President of BAVC



Margret Suckale

"IN THIS INITIATIVE, THE AIM IS TO ACHIEVE GREATER OVERALL SUSTAINABILITY - AT THE ENTERPRISE, INDUSTRY AND SOCIETY LEVEL."

assure the future of our industry – and hence that of our employees and their families as well. Innovations are the seeds of our international competitiveness and make a major contribution to the future viability of Germany as an industrial location.

Is it not a trifle over the top to think that chemistry has a solution for almost every challenge of the 21st century?

Vassiliadis: The chemical industry cannot solve all of the world's problems – but what we can do is create possibilities. Naturally, some of our solutions may meet with criticism, for example in the area of genetic modification. That makes it all the more important to have an open and responsible exchange between business, politics and science regarding the opportunities and the risks. In our complex world, there are no simple truths.

Suckale: In this initiative, the aim is to achieve greater overall sustainability – at the enterprise, industry and society level. Obviously, we have to do our homework first and show which contributions we can and do make to sustainable development. We are working continuously on this because authenticity is the only way to present this topic in a credible manner and gain support for it. This includes resource-conserving, environmentally sustainable manufacturing operations and long-term human resources

policies. We recognised this very early on and have been addressing these topics for many years.

Kley: The chemical industry has already achieved a great deal. The image of chemical factories as places emitting smoke and bad smells is a complete anachronism. Today our high-tech products are enablers, helping people to live sustainable lives in the industrial and knowledge society of the 21st century.

That sounds as if the chemical industry is already doing everything right. So why did you establish the Chemie³ initiative? And what do you aim to achieve with it?

Vassiliadis: Certainly, we are already doing a lot of things well, but of course not everything. It would be presumptuous to claim anything else. However, I find it very encouraging that we have got together to collate all the individual efforts that were undertaken in the past so that we can use our combined power to systematically organise and drive these actions. We are a strong industry and want to be heard as one loud and clear voice in the concert of sustainability players. Our aim is to establish a sustainability strategy in the industry which will get every enterprise, from the smallest to the largest, looking in the same direction.

Michael Vassiliadis



"WE ARE A STRONG INDUSTRY AND WANT TO BE HEARD AS ONE LOUD AND CLEAR VOICE IN THE CONCERT OF SUSTAINABILITY PLAYERS."

That's a very ambitious goal.

Suckale: In many companies, sustainability is already a major priority. But there are still many challenges ahead and our joint initiative has only just begun its work. By drawing up our industry guidelines, we have created a concrete framework for over 2,000 enterprises to base their operations on. That was an important step. Of course, not every company will be able to implement everything. The possibilities and scope will vary according to size and products. The important thing is that companies address the topic of sustainability in all its dimensions and set themselves targets and goals that they can fulfil.

Are there areas where your industry failed to do all it could have done?

Kley: We have learned our lessons there. There is no comparison between today's safety standards and those of the 1970s. It is true that the chemical industry is one of the most strictly regulated industries today. However, the industry itself has launched its own initiatives. One example is Responsible Care, which has guided the industry's practices in environmental, safety and health matters for the past 20 years. And this new sustainability initiative shows that action is taken voluntarily without any political pressure being brought to bear. That seems to have been forgotten in the wake of the financial crisis.

Vassiliadis: A not insignificant point is the fact that we sat down together to develop a comprehensive understanding of sustainability, giving equal consideration to the economic, environmental and social dimensions. In the public debate, sustainability is often reduced to environmental protection. We, however, believe that the three dimensions are interdependent and cannot be considered in isolation. People must experience sustainability as something that improves their quality of life. When that happens, they will support it.

In your view, what are the biggest challenges facing your industry in Germany?

Kley: Germany has a highly skilled labour force but no raw materials. Our opportunities



Dr. Karl-Ludwig Kley

therefore lie in innovative products for a sustainable future. But our sustainable solutions must also generate earnings. And our strategy will only work if the framework conditions in Germany allow competitive research and production in our own country. Not just companies but politicians too will be confronted with conflicting goals time and again. The chemical industry is open to dialogue on such matters.

Suckale: Demographic change is right up among the top challenges on the list. Not only do we have an ageing population, but there are fewer and fewer people in the country. This is having major social and economic impacts. The number of available skilled workers will shrink dramatically. In the chemical industry, we therefore rely on special training and education concepts, a sector-specific demographic collective agreement and modern work models in order to attract good employees and retain them long-term. But improved career-family balance and attractive compensation are also essential in ensuring that we remain attractive as employers.

"INNOVATIONS ARE THE SEEDS OF OUR INTERNATIONAL COMPETITIVENESS AND MAKE A MAJOR CONTRIBUTION TO THE FUTURE VIABILITY OF GERMANY AS AN INDUSTRIAL LOCATION."

THE CHEMIE³ INITIATIVE

FOR A SUSTAINABLE FUTURE

The initiative has been launched: Under the umbrella of Chemie³ (Chemistry³), the German Chemical Industry Association (VCI), the Mining, Chemical and Energy Industrial Union (IG BCE), and the German Federation of Chemical Employers' Associations (BAVC) have joined forces to further the cause of sustainable development. In a dialogue with their stakeholders, the partners in this alliance will be driving sustainability forward in their industry.

The partners in the alliance have set themselves the goal of anchoring sustainability as a mission within the industry. Our conduct is rooted in the fundamental principles of protecting people and the environment and striving for good and fair working conditions. Examples of this are the Responsible Care programme and the chemical industry social partnership.

Innovations from the chemical industry make important contributions to solving global challenges. At the same time, we know that there are a great many challenges still to be addressed. The industry not only sees sustainability as an obligation to future generations but also as an opportunity to establish a strategy for the future of the chemical industry in which economic success is coupled with environmental responsibility and social equity.

We will be using our combined strengths to pursue this commitment in the future. The industry association VCI, the union IG BCE and the employers' federation BAVC have formed a unique alliance – the sustainability initiative Chemie³ (Chemistry³) – specifically for this purpose. In March 2012, the alliance partners came together at a first workshop

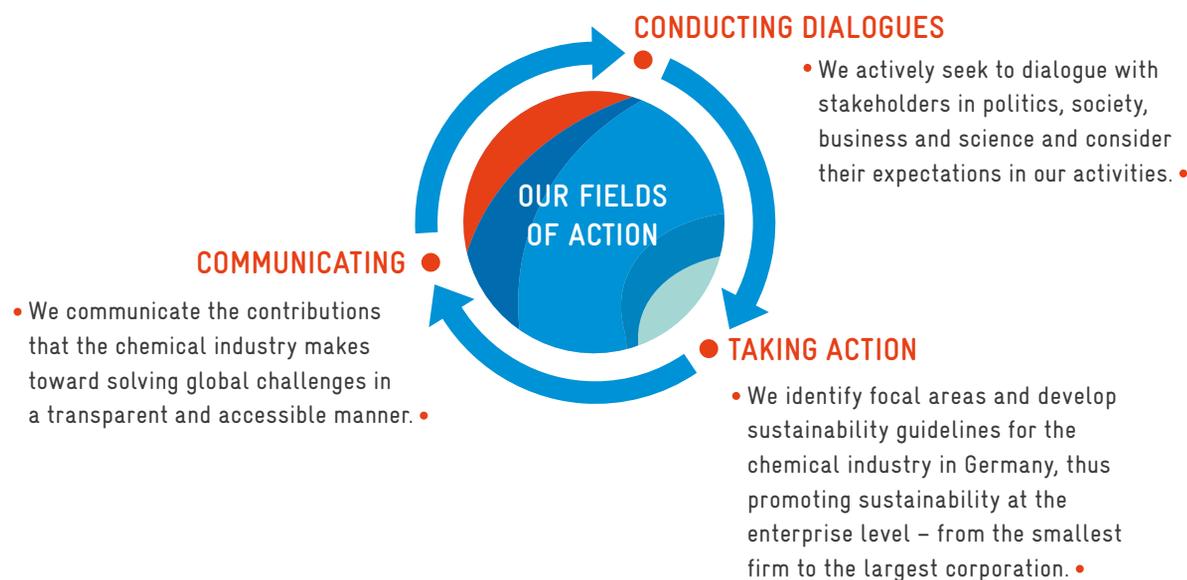
in Kassel to establish their common understanding of sustainability. Around 50 representatives of chemical companies, associations and the trade union discussed where the chemical industry stood in terms of sustainability and came to an agreement to further promote and actively drive sustainable development throughout the sector. The three partners in the alliance are united in their will to succeed and awareness of their obligation to the industry and society.

Comprehensive understanding of sustainability

The initiative considers all three dimensions of sustainability – economy, environment, and society:

- Economic success, which is the basis for developing the industry and our wealth.
- Protection of people and the environment through environmentally acceptable products and processes, and also through high safety standards, product stewardship and smart efficiency and raw material strategies.
- Social responsibility, which in Germany is based on the social market economy and the strong social partnership within the chemical industry.

THE INITIATIVE'S THREE FIELDS OF ACTION



SUSTAINABILITY IN THREE DIMENSIONS



In our understanding, these three dimensions are interdependent and cannot be considered in isolation.

Our guidelines and focal areas

At the heart of the Chemie³ initiative are the “Sustainability Guidelines for the chemical industry in Germany”. They serve as guiding principles for the sector and support compa-

nies and their employees in expanding their contributions to sustainability. The guidelines were developed by analysing and prioritising sectoral and sustainability-related global and national guidelines, standards and regulations. This led to the identification of twelve focal areas concerning strategy, implementation and communication within a company.

Based on these twelve focal areas, we then formulated the “Sustainability Guidelines for the chemical industry in Germany” in consultation with internal and external stakeholders. They show companies and their employees the main areas where action is needed, provide orientation and establish a framework for promoting sustainable development within an enterprise.

In order to gain a broad consensus across the industry, VCI, IG BCE and BAVC ensured that their members were closely involved in this work from the beginning. Measures included a comprehensive online consultation in which members had the opportunity to participate in the shaping of the common guidelines on sustainability. The signing of the guidelines has laid the foundation stone for the actual work ahead. The focus is now

OUR GUIDELINES AT A GLANCE

1. Integrating sustainability into the corporate strategy
2. Achieving sustainable investments and value creation
3. Promoting economic stability and global cooperation
4. Driving sustainability through innovation
5. Implementing sustainability in operational processes
6. Securing decent work and an active social partnership
7. Managing demographic change and securing skills
8. Protecting people, the environment and biodiversity
9. Promoting resource efficiency and climate protection
10. Engaging with communities as good citizens
11. Creating transparency and showing integrity
12. Fostering a dialogue and enhancing participation

The full version and the preamble to the Guidelines can be found on page 48.

VOICES: CHEMIE³ IN DIALOGUE "SUSTAINABILITY AS PRE-CONDITION FOR LONG-TERM BUSINESS SUCCESS."



Georg Kell
Executive Director, UN Global Compact

"Creating long-term value for society and business is increasingly tied to the ability to exercise sustainability leadership. Integrating environmental, social and good governance into corporate strategies and operations is not only a necessary pre-condition for long-term business success. It is also a way to ensure that contributions to society are maximized along positive trajectories. As global interdependence deepens, this is becoming ever-more important. I applaud the German chemical industry for embarking on this journey."

on putting them into practice. Tools will be developed to support the member companies in doing this. These include guidance documents on selected topics and compilations of transferable best-practice examples.

The initiative has only just been launched and there are still many challenges ahead. Nor will every company be able to implement all of these guidelines. The challenges, sustainability requirements and opportunities will vary according to the market segment, size of the enterprise and customer requirements. What is important is that the companies continuously address sustainability in all its dimensions and seek to develop it further within the scope of their own capabilities.

Dialoguing with our stakeholders

An elementary component of this initiative is open dialogue with our stakeholders. We therefore involved them in our work and ideas – including development of the guidelines – right from the beginning. This

is because we believe sustainable solutions can only be developed successfully through constant exchanges and collaboration between policy-makers, science, business and society.

We want to understand the expectations stakeholders have regarding the sustainability process in our industry and take account of their knowledge, value systems and interests in our actions.

We have already gained important insights through our talks with representatives from business, environmental organisations, the churches, and political circles. In the eyes of our stakeholders, the environment, health and safety were and are the central sustainability topics in our industry. Regarding social aspects, the chemical industry is perceived as a leader because of its successful social partnership. Overall, our sector is recognised as having a continuous improvement process, and the establishment of this alliance is considered to be a step in the right direction. New technologies like genetic engineering or nanotechnology, on the other hand, are often discussed in critical terms. As before, stakeholders consider that one of the main challenges for the industry is assuming responsibility for products and processes over the entire product lifecycle and transferring its own high standards to the value chain.

With Chemie³ we are continuing to maintain our stakeholder dialogues as before.

Transparent communication

We will keep the general public informed about the development of our Chemie³ initiative – through discussions, publications, and on our website at www.chemiehoch3.de. This will make our contribution to solving global problems and the associated challenges more visible and more understandable.

VOICES: CHEMIE³ IN DIALOGUE "THE CHEMICAL INDUSTRY MUST RAISE THE BAR STILL HIGHER."



Dr. Günther Bachmann
Secretary General, Council for Sustainable Development

"The chemical industry already has high standards of innovation and responsibility, productivity and environmental protection, methodical approach to life cycle assessments and development of sustainability solutions, and must raise the bar still higher. We can expect a great deal and still more from a sustainability strategy in the chemical industry: new work models for Generation Y and people of the third age, a solution to the palm oil problem, full recycling of packaging, sustainability chains from raw material to raw material, production technologies for artificial photosynthesis and use of the 'waste product' carbon dioxide, innovations for organic farming, and much more in the way of efficiency and synthesising of new substances as a basis for new sustainable solutions.

This social partnership initiative benefits from the diversity of large, medium-sized and small companies with their wide variety of business models. A sustainability strategy should make full use of this structure. Whereas it has in the past often been misunderstood and served as an argument to ward off environmental policies, an attempt should be made to involve the employees and maximise available opportunities."



More information at:
www.chemiehoch3.de/ambitions

CREATING VALUE

A STRONG INDUSTRY FOR MORE GROWTH AND WEALTH

The industrial sector is the backbone of the German economy, generating almost one quarter of the gross domestic product. Within this sector, products and innovations from the chemical industry provide the basis for industrial manufacturing in Germany. The chemical industry thus makes a major contribution to the success of the German economy.

184

billion euros
total turnover

Chemical industry as a driver of the German economy

The chemical industry is a growth and wealth driver in Germany. After automotive and mechanical engineering, chemicals ranked as the third-largest industry in 2011 with a turnover of 184 billion euros, contributing a good two per cent to total value added in Germany. Globally, Germany is the fourth-largest producer of chemicals after China, the USA and Japan.

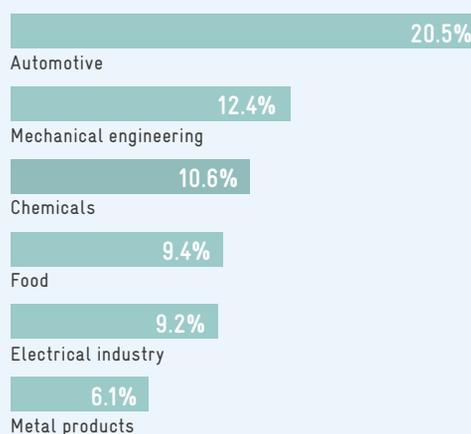
The chemical industry is closely linked with all other industrial sectors. 82 per cent of its products are intermediate goods destined for use in downstream industrial processes. The industry thus stands at the beginning of industrial manufacturing chains in Germany. Furthermore, the increasing complexity of industrial production favours the creation of new industrial services. This contributes in addition to the growth of the services sector in Germany.

The economic strength of the chemical industry is reflected in attractive employee compensation structures, which in turn contributes to wealth and quality of life in Germany. Due to the high productivity levels,

the 428,000-plus employees of the German chemical industry have an average income that is 25 per cent higher than the average for employees in industry as a whole. The average annual compensation in the chemical industry is more than 52,000 euros.

THE LARGEST MANUFACTURING INDUSTRIES

Share of turnover in Germany



Source: German Federal Statistical Office 2012

82%

of all chemical products are intermediate goods used in other industrial processes.

Strong SME base

More than 90 per cent of chemical companies in Germany are small and medium-sized enterprises (SMEs). Altogether, they employ more than 160,000 people – accounting for well over a third of all jobs in the chemical industry in this country.

Many SMEs are family-run businesses. They frequently have strong local ties in their region, including the less densely populated areas. As a result, they offer good jobs even in structurally weak regions. Many of these small and medium-sized enterprises have carved out niche markets for their products and constitute an important element of the value chain. Every year, SMEs contribute a share of around 30 per cent to the overall turnover of the chemical industry and generate revenues amounting to some 56 billion euros.

Long-term orientation

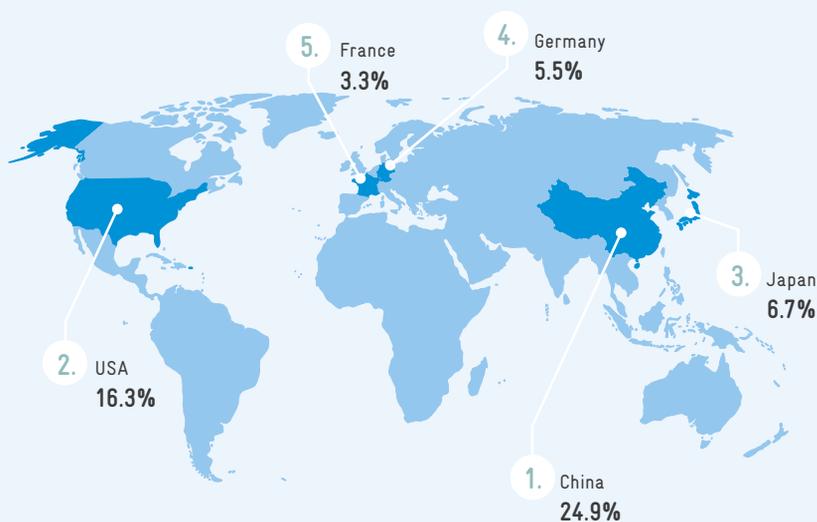
The companies in the German chemical industry invest more than six billion euros annually in their production plant and equipment. This represents an investment rate of more than three per cent of turnover. In addition, they spend some nine billion euros per year on research and development within Germany. After the automotive and electrical industry, the chemical industry therefore has the biggest budget for this item.

Future-proof thanks to international business

Today, the German chemical industry earns just under 60 per cent of its turnover through business with customers abroad. In addition to this, foreign subsidiaries of German companies generate almost the same level of turnover as the chemical industry does in Germany, and employ almost as many people overall. The strong links with foreign markets and locations ensure that Germany profits from growth in those regions. This in turn secures jobs in the domestic economy.

WORLD'S FIVE LARGEST CHEMICAL-PRODUCING NATIONS

World market shares



Source: Eurostat, Feri, VCI 2011

VOICES: CHEMIE³ IN DIALOGUE
 "INNOVATION AND SUSTAINABILITY ARE THE KEY SUCCESS FACTORS FOR THE CHEMICAL INDUSTRY."



Prof. Dr. Michael Hüther
 Director of the Cologne Institute for Economic Research

"The chemical industry has always shown exceptional levels of competitiveness and strong dynamic growth. These are due especially to the high R&D expenditures and the consistent use of networking. Innovation and sustainability are the key success factors for the chemical industry. They also ensure that the general public becomes aware of how significant this industry is for successful structural change. Now is the time for the chemical industry to provide new impetus to carry this forward in the future. The sustainability initiative reflects the central global challenges. What is important above all is to reinforce competitiveness through intensive use of research and production networks."

ACHIEVING MORE TOGETHER

SOCIAL PARTNERSHIP IN THE CHEMICAL INDUSTRY

Good and competitive working conditions are a basic principle throughout the chemical industry in Germany. This is exemplified in the industry's strong social partnership. Innovative, pragmatic, successful – with the special kind of cooperation that exists between the industrial union IG BCE and the employers' federation BAVC, the chemical industry has assumed a pioneering role.

With its aim of sustainably shaping decent work and a future-capable orientation for enterprises, the social partnership in the chemical industry has proven its worth over more than 40 years. It is the essential foundation for cooperation between IG BCE and BAVC – and the key to fairness between employers and employees. The social partnership has therefore made a vital contribution to sustainability in the chemical industry. Just how successful this form of respectful partnership can be is evident in one unparalleled achievement: since 1971 there have been no strikes in the chemical industry in Germany.

Code of ethics for responsible conduct

Both the employers and the union understand the social partnership as a mission to work together in a cooperative and pragmatic manner to seek the best solutions for companies and employees alike. It is not a question of ironing out differences in interests. Instead, the chemical industry's social partnership offers a basis for continuous dialogue as equals in order to identify points in common and to deal constructively with divergent views.

This relationship based on mutual respect has been strengthened and deepened by what is known as the Wittenberg Process. In intensive discussions, IG BCE and BAVC came to an agreement on shared principles. The "Guidelines for responsible action within the social market economy" which were signed in Berlin on 14 August 2008 have served the social partners as a framework for cooperation ever since then.

Pioneering role in Germany

Innovativeness is the special feature of the collective agreements within the chemical industry. Earlier than others, the social partners in the chemical industry began tackling new challenges, in particular those of globalisation and demographic change. In doing so, they demonstrated socio-political responsibility and established a basis for actively participating in shaping these mega-trends.

The parties to the collective agreements in the chemical industry made allowance for changes ensuing as a result of global competition by including options for flexibilisation

Since **1971**
there have been no strikes in the chemical industry in Germany.

and opening in the agreements. They often acted as pioneers, as in the case of working hours and salary corridors.

At the same time, the collective agreements ensure that employees receive a fair share of the industry's economic successes. The compensation paid in the chemical industry reflects the high performance and competitiveness of the enterprises.

WORKING LIFETIME AND DEMOGRAPHY

With the collective agreement "Working lifetime and demography" signed on 16 April 2008, the chemical industry was the first sector in Germany to develop comprehensive answers to the progressive ageing of society. The agreement gives the enterprises and their employees effective instruments for use in business practice:

- Demographic analysis,
- Measures for designing work processes that are compatible with age, ageing and health,
- Measures for gaining skills throughout the working lifetime, and
- Measures for (own) retirement planning and the use of flexible tools for transitioning smoothly between education, earning and retirement phases.

Furthermore, IG BCE and BAVC have created instruments allowing the social partnership to be exercised on an even broader scale:

- Non-collective social partner agreements on special topics such as securing business locations, education, or equal opportunities.
- Joint institutions of the social partners in special fields, such as the education foundation (CSSA), the chemical pension fund (CPF), the society for informing works councils on environmental protection in the chemical industry (GIBUCI), and the benefit society of the chemical industry (UCI).
- Active participation in the European social dialogue within the chemical industry.



THE WITTENBERG PROCESS

In 2007, the collective agreement partners of the chemical industry came together in Wittenberg (the city of Martin Luther fame) and laid foundations for the renewal and deepening of their social partnership. In a series of workshops, representatives from the companies, union and society in general, discussed a wide variety of sustainability aspects. One central result of the Wittenberg Process is the social partner agreement "Guidelines for responsible action within the social market economy" (Code of ethics) which was signed in Berlin one year later, in August 2008, in the presence of the then Federal President Horst Köhler. The aim of this agreement is to promote value-oriented, fair conduct within the chemical industry and thus to strengthen trust in the social market economy. IG BCE and BAVC base their work on these guidelines.



VIEWS: FROM THE INDUSTRY "CONFLICT HAS ITS PLACE IN THE SOCIAL PARTNERSHIP."



Thomas de Win
Works Council Chairman, Bayer AG

"The social partnership is one of the location advantages of the chemical industry in Germany. It did not happen overnight, but grew over the years. However, the social partnership is not a "sunshine party"; it has to prove its worth in rough weather as well. Conflict has its place in the social partnership. The important thing is that issues are debated with the will to arrive at a consensus."

VOICES: CHEMIE³ IN DIALOGUE
"INVESTING IN MUTUAL TRUST."



Dr. Martin von Broock
Member of the Board, Wittenberg Center for Global Ethics

"Responsibility for good and fair working conditions is a basic principle in the chemical industry. The social partnership between IG BCE and BAVC is exemplary in this respect. With its aim of sustainably shaping decent work and a future-capable orientation for enterprises, the social partnership has been in existence for more than 40 years now.

The social partners within the chemical industry have developed a framework which allows them to resolve unavoidable conflicts of interest in a constructive rather than a confrontational manner. The experiences of the past show that both parties are better off as a result of this, and that the bedrock of trust that has grown is a real asset. The parties must continue to invest in this mutual trust, particularly with an eye to the challenges ahead. The sustainability initiative is an important step here."

Safety first

Avoiding accidents and maintaining the health of employees at their workplaces is very much part of the shared responsibility. For this reason, proactive occupational health and safety is also covered by social partner agreements – and with exemplary results: In 2011 there were 9.5 occupational accidents per million hours worked in the chemical industry. Within the past 20 years, the industry has thus halved the number of occupational accidents per million hours worked. The average figure for industry was 16.2 occupational accidents per million hours worked.

Improving equal opportunities

Equal opportunities for men and women have been an important focus of factories in the chemical industry for a long time, especially in the context of an ageing population. Nevertheless, the companies intend to do still more in this area and will continue to strive to raise the percentage of women. In order to promote family-friendly human resources policies, IG BCE and BAVC support the parties involved in the factories by offering advice, guidance documents, check-lists, and by organising exchanges of information and experiences. At the same time,

MILESTONES OF THE SOCIAL PARTNERSHIP

1975 BAVC and IG BCE establish the benefit society of the chemical industry (UCI), the first joint institution of the social partners. Its mission then: to support chemical industry employees who had lost their jobs through no fault of their own.

1981 Beginning of negotiations on a compensation agreement to eliminate differentiation between blue collar and white collar workers.

1988 Federal collective pay agreement comes into force; BAVC and IG BCE receive an award from the Bertelsmann Foundation for their commendable relationship as social partners.

1990 With joint recommendations for contacts between works councils at the European level, the social partners in the chemical industry strengthen the European unification process and pave the way for European works councils.

1971 Last industrial dispute in the German chemical industry more than 40 years ago; ended by the Bonn Agreement.

1977 Collective agreement for young people without a school leaving certificate and adolescents with an migration background.

1987 Establishment of the Society for the information of works councils on environmental protection in the chemical industry (GIBUCI).

BAVC and IG BCE found the Vocational Education Council for the chemical industry, with equal representation.

1989 Collective agreement on promoting the integration of youth. Today this has evolved into the "Starting work" programme and the SME initiative "StartPlus".

BAVC and IG BCE agree on common principles for fostering women in the chemical industry.

they jointly approach political institutions to put forward their case for appropriate and effective framework conditions allowing a better career-family balance.

Utilising diversity

About 20 per cent of Germans today have migration background. They bring their different languages, religions and lifestyles with them to their new home country and are an elementary part of society and the working world. This diversity is both a great opportunity and a challenge for the chemical businesses. In line with a social partnership agreement concluded in 2008, BAVC and IG BCE have been urging companies to make better use of the richness of these cultures and the diversity of experience that people of different origins have to offer. Agreements on the enterprise level to promote diversity within companies are also highly recommended.

Making provisions for the third age

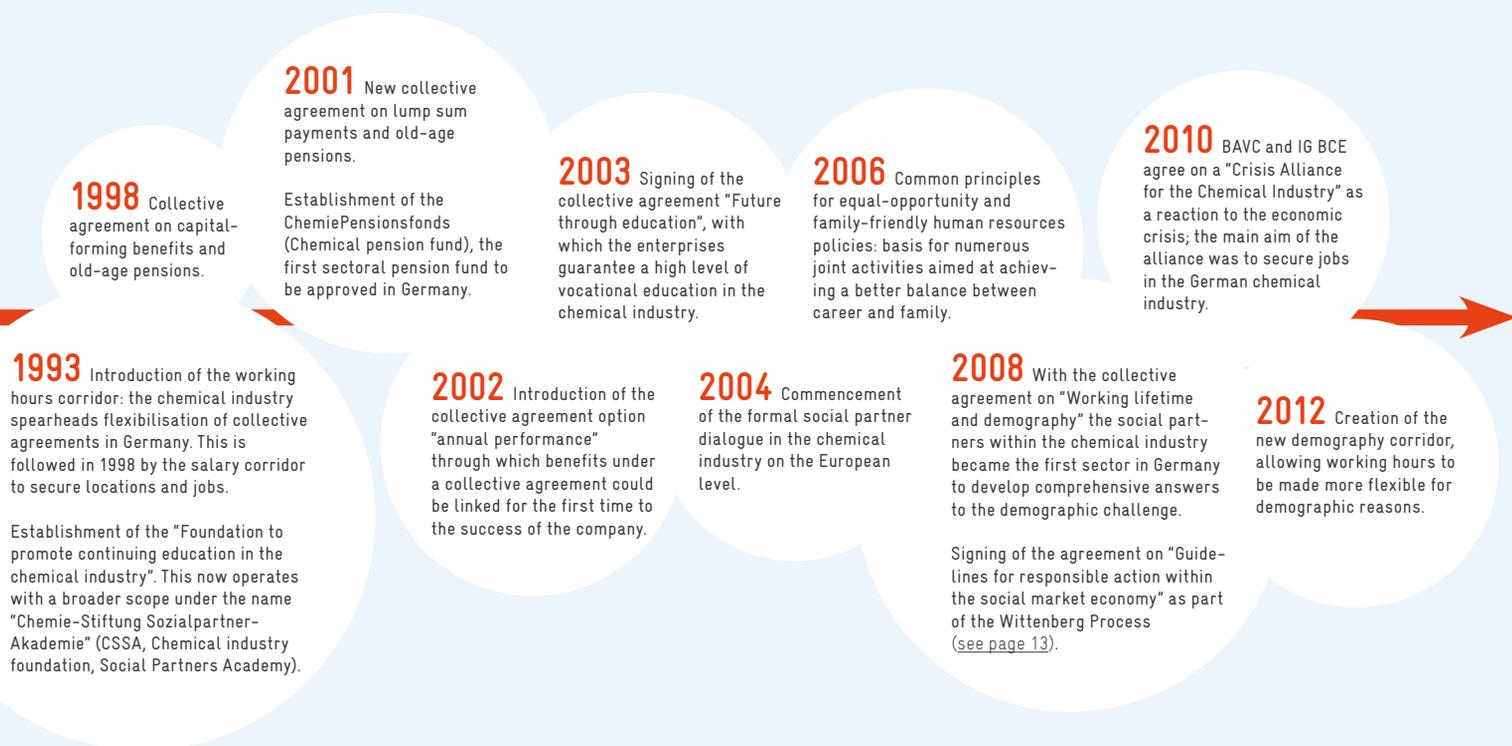
Considering the rate of demographic change and the foreseeable shortfall in the state pension system, making adequate financial provisions for the years after retirement is becoming more and more important. IG BCE and BAVC tackled this subject early and

signed a collective agreement on retirement planning as early as 1998, following this up by the first German sectoral pension fund (ChemiePensionsfonds, CPF) in 2001. In the German chemical industry, about 80 per cent of employees are today making provision for their retirement under the collective agreement. On average, they invest 906 euros per year to secure their standard of living as senior citizens. Under the collective agreement, each full-time employee is entitled to a sum of up to 613.55 euros per year, which is paid out by his or her employer for pension planning. In addition to this, 70 per cent of people employed in the chemical industry are entitled to a workplace pension under schemes voluntarily set up and fully financed by their employers.

The working world is forever changing: a better work-life balance and career-family balance, education as a prerequisite for social inclusion, as well as challenging and satisfying jobs – these are just some of the expectations and needs that employees, works councils and management boards are confronted with, as are the union and the employers' federation. The social partnership offers the best opportunities to find solutions to them.

80%

of chemical industry employees pay into pension schemes under the collective agreement.





TRAINING, NURTURING AND SKILL-BUILDING

APPRENTICES AND QUALIFIED STAFF IN THE CHEMICAL INDUSTRY

More than 428,000 people work in the chemical industry. One of the sector's declared goals is to hold its own in the competition for talents by offering attractive jobs and working conditions.

In the coming years, the labour pool – and with it the number of qualified personnel – will shrink substantially in Germany. By 2030 there will be 6.4 million fewer people in the labour market than there are today. We see this demographic trend as a major challenge for our industry. The task will be to secure the required levels of qualified staff – and hence the innovative power and competitiveness of the enterprises – in spite of the shrinking labour pool. Bearing this in mind, the chemical industry was the first sector in Germany to conclude a collective agreement on demographic change in 2008.

Through numerous initiatives and projects we develop solutions to keep pace with changing labour market conditions. Already, the companies in the industry are training 27,000 young people today (BAVC figures). This is because they need qualified and competent employees to meet challenging job profiles. In all, the industry offers over 50 different vocational training courses.

Attracting and nurturing junior staff

In order to assure a steady stream of junior employees, employers in the chemical industry have launched a training campaign called “Elementare Vielfalt” (Elementary Variety). A package comprising a website, information materials and marketing activities supports the chemical industry companies offering vocational training in competing for young recruits.

In addition, the Chemical Industry Fund (FCI) has been promoting the teaching of chemistry at schools, sponsoring young chemists, and encouraging fundamental research in chemistry and related disciplines since 1950.

For young school leavers who are not yet ready to begin an apprenticeship, the social partners within the chemical industry instituted a support programme called “Start in den Beruf” (Starting work) as far back as the year 2000. This initiative assists young people in gaining the necessary qualifications for an apprenticeship or integrating into the working world.

With the aim of preventing a shortage of skilled staff in the future, the industry has also engaged in the area of dual study (cooperative education) courses. Many enterprises in the chemical sector thus offer the opportunity to combine an applied study course at a Berufsakademie (university of cooperative education) or a regular university with practical vocational training in an industrial environment.

Chemical industry companies want to attract the best and most capable talents and retain them long-term by providing interesting development opportunities, a modern working environment, and competitive compensation.

27,000

apprentices work in
the chemical industry.

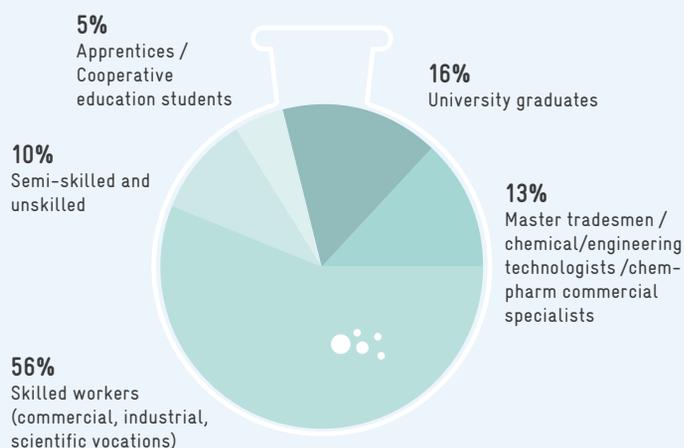
To underline the significance of vocational training in Germany, IG BCE and BAVC already signed a collective agreement in 2003 in order to secure the provision of apprenticeships long into the future.

Above-average continuing education

In terms of scope and duration, the sector also promotes continuing education more intensively than most. According to a study by the Cologne Institute for Economic Research, some 93 per cent of chemical companies provided continuing education programmes for their employees in 2010. By comparison, the average for all sectors of industry is 83 per cent. At 1,467 euros per employee, the chemical companies also invested significantly more in the continuing education of their personnel than the average for companies in all sectors (1,035 euros).

The companies in the chemical industry believe in a social climate that is characterised by mutual respect, a sense of responsibility, and fairness. The management and works council, the union and the employers federation all consider that the need to address changes in the working world is a mandate to shape the future jointly. They approach their tasks in a pragmatic, result-oriented manner which also takes account of different interests.

QUALIFICATIONS STRUCTURE IN THE CHEMICAL INDUSTRY



Source: BAVC 2011

VIEWS: FROM THE INDUSTRY "I LIKE THE VARIETY OF THINGS YOU CAN DO."



Dorothee Hoch
Pharmaceutical technician,
Boehringer Ingelheim Pharma GmbH & Co. KG

"Chemistry means variety: while training to become a pharmaceutical technician, I am gaining insights into all sorts of areas – from the development of a new medication in the lab through to large-scale production. Even for apprentices there are opportunities to gather these experiences at some of the company's other locations, including those abroad. It is precisely the variety of things you can do that gives me the assurance of having found a job that is in demand and secure. And, not least, the working atmosphere is great."

VOICES: CHEMIE³ IN DIALOGUE "DEMOGRAPHIC AGEING IS A GREAT CHALLENGE."



Prof. Dr. Thusnelda Tivig
Rostock Center for the Study of Demographic Change

"One major challenge is demographic ageing. There are too few young people entering the workforce, while numbers of dementia sufferers are rising rapidly in the general population. Industries which make a point of employing older people, adapting workplaces accordingly, and produce the technical innovations which enable social participation of the very oldest will create competitive advantages for themselves while also helping to make life better. The chemical industry can be a trailblazer here."



RESPONSIBILITY IN ENVIRONMENTAL AND SAFETY MATTERS

RESPONSIBLE CARE SETS STANDARDS

The chemical industry is working continuously to improve its environmental, health and safety performance. Leading the way in this respect is the global Responsible Care initiative, whose guiding principles have already been applied in Germany since 1991.

With the Responsible Care initiative, the chemical industry around the world, including Germany, has committed to performing better every day than required by legal regulations. Both management and workforces work daily to improve the levels of environmental protection, health and safety in their facilities. And Responsible Care (RC) has in fact been a part of everyday business practices in Germany for more than 20 years. Those involved concentrate on activities within the site perimeter as well as in the community beyond it.

Global, regional and local focus

Since 2006 the content of the various national Responsible Care programmes has been based on the Responsible Care Global Charter of the International Council of Chemical Associations (ICCA). RC is an important contribution made by the industry to sustainability. This is also reflected in the international subline to the logo: "RC – Our Commitment to Sustainability". The implementation of this commitment differs from one region to the next around the world and depends on the respective understanding of sustainability. For the German chemical

industry, sustainability means achieving a balance between the three aspects of economy, environmental protection and social equity, and this is the umbrella for its Responsible Care activities. The RC initiative plays a key role in furthering the sustainable development of the chemical industry in Germany.

Through their commitment to Responsible Care, chemical companies of all sizes pledge to make decisions wisely and act responsibly. Within the scope of the RC initiative – which in daily operations focuses on aspects of environmental protection, occupational health and safety, general safety, security and site dialogues – it has been possible for more than 20 years to measure and document what has changed or improved. This is made accessible to the general public through many examples in the annual Responsible Care reports.

Safety at work and during transport

According to surveys by German social accident insurance institutions, the level of safety in the chemical industry is especially high. In 2011 there were 9.5 occupational accidents per million hours worked, whereas

the average figure for industry was 16.2 occupational accidents per million hours worked. Great emphasis is also placed on safety when transporting the (intermediate) products. The number of accidents with release of chemicals has been dropping steadily for many years. There is less than one accident per million tonnes of transported chemicals. And if an accident does happen, the plant fire departments of the chemical industry provide assistance through their TUIS system (transport, accident, information and emergency response system).

Saving energy and resources

Another contribution the chemical industry makes to sustainability is manufacturing its products with the least possible impact on the environment. This goal has a long tradition in the sector. Its specific energy demand fell by around 50 per cent per product unit between 1990 and 2010, and greenhouse gas emissions were cut by 75 per cent per product unit over the same period. Overall, greenhouse gas emissions were reduced by 49 per cent while the production of chemicals rose by more than half. The chemical industry thus makes a major contribution to achieving German climate protection targets.

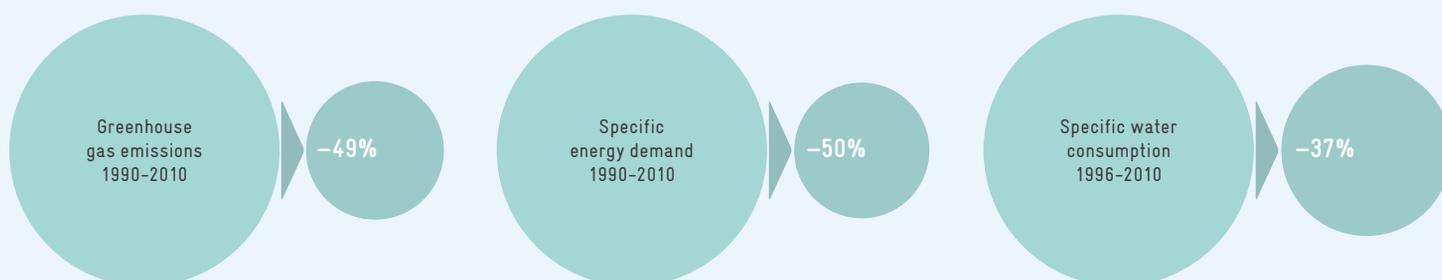


RESPONSIBLE CARE: A BRIEF RETROSPECTIVE

As early as 1978, the Canadian Chemical Producers Association (CCPA) resolved to draw up guidelines and principles for responsible conduct. However, these did not come into effect until 1984/1985. What prompted the Canadian chemical industry to make its public commitment to Responsible Care was the chemical disaster in Bhopal, India. The industry realised that something unthinkable had actually happened. This wake-up call was what finally accelerated the establishment of the Canadian Responsible Care programme.

VCI published its "Chemistry and the Environment" principles in 1986, thus laying the foundation for the German "Verantwortliches Handeln" (Responsible Care) initiative. Five years later, the extended board of VCI decided to set up a Responsible Care concept along international lines. The VCI environmental guidelines became the guiding principles of the German Responsible Care programme. In their current edition at any time, they are binding on the members of the association. The guiding principles for Responsible Care were formally adopted by the VCI members meeting in 1995. Responsible Care was then extended to the supply chain through a partnership agreement with Verband Chemiehandel, the German association of chemical distributors.

IMPROVED ENVIRONMENTAL PERFORMANCE



RESPONSIBLE CARE AWARD 2012

Resource efficiency was the focus of the 2012 Responsible Care Award. The many project submissions show that the German chemical industry is up among the frontrunners when it comes to saving resources. The first prize went to Rhein Chemie Rheinau GmbH, Mannheim, for a purpose-designed process for recovering the raw material phenol from mixed waste-water streams. The production of a special additive that is used to manufacture certain high-grade polymers generates process-related mixed waste-water streams containing a great deal of phenol. Phenol is an important base chemical produced from mineral oil. However, residues containing phenol have to be disposed of as hazardous waste. Thanks to the innovative process, 150 tonnes of phenol per year can be saved, and an even larger volume of liquid hazardous waste is no longer generated. The level of health protection for employees is also improved as a result.

VIEWS: FROM THE INDUSTRY "HEALTH AND SAFETY IS THE MOST IMPORTANT THING IN PRODUCTION"



Chris Kietzerow

Skilled production operator in the filling plant, cleaning systems, Bufa GmbH & Co. KG

"For me as a production worker, sustainability is being aware of all the dangers involved when handling hazardous substances, and also having the training to know what to do to avoid accidents. Just in case something did actually happen, my company gives its personnel a neutralising agent, which we carry with us all the time. But we want to make sure we won't ever have to use it!"

Emissions down, water consumption unchanged

Emissions to the air have been at a very low level for many years. Whereas output rose by 200 per cent from the mid 1960s to the mid 1980s, pollutant emissions sank by up to 90 per cent. The chemical industry has also significantly reduced its specific water consumption, the amount of water used per product unit, over the past 15 years. While production has climbed by more than 32 per cent, water consumption was kept constant. Overall, the chemical industry used 2.75 billion cubic metres of water in Germany in 2010.

Continuous investment in environmental protection

Between 1995 and 2009 the German chemical industry invested more than 4.3 billion euros in downstream environmental protection, such as filters or sewage treatment plants. For upstream measures, which ensure that impacts are avoided in the first place, the industry spent approximately 839 million euros from 2004 to 2009. Recycling of substances has meant that wastes are avoided or can be recovered and re-used. In addition, the sector spends some two billion euros per year on running environmental protection systems.

Responsibility for processes and products

The safe handling and use of chemical products is a focus of activities along the entire value chain, from research and development to procuring raw materials, from production and marketing to use at the customer and ultimately disposal. The chemical industry works continuously to ensure that its products are safe for people and the environment when used responsibly and for the intended purpose. The industry's understanding of safety also includes transparent communication and conveying information relating to product safety by means of safety data sheets, emergency hotlines, and training courses on how to handle products.

REACH:

a demanding task for the chemical industry

In order to improve product stewardship even further, the EU Commission established a standardised EU-wide framework for the evaluation of substances in 2007 with the European chemicals regulation REACH (Regulation concerning the Registration, Evaluation,

Authorisation and Restriction of Chemicals). REACH is one of the most advanced and most stringent pieces of legislation on chemicals worldwide. Its aim is to assure a high level of protection for human health and the environment by making more information available on chemical substances and achieving greater transparency regarding their use. Since the European Chemicals Regulation came into force, all those involved have worked intensively to ensure that it will function well. The chemical industry is making great efforts to fulfil REACH requirements correctly by the set deadlines. The sector is being supported in this by the REACH Service Platform initiated by VCI.

REACH is based on the principle that manufacturers, importers and downstream users assume responsibility for the safe use of their chemicals. The main provisions of the regulation include a general obligation that all substances produced in volumes greater than one tonne per year must be registered

with the European Chemicals Agency (ECHA), the evaluation of these substances, and further regulation of certain dangerous substances, for example through authorisation and restriction procedures.

Furthermore, the International Council of Chemical Associations (ICCA) has instituted the Global Product Strategy (GPS) based on the goals of the United Nations.

The GPS initiative aims to improve and harmonise product stewardship in the chemical industry around the world. The intention is to reduce the differences between the emerging markets and the industrialised nations. At the same time, this should contribute to greater safety and fair competition on the global level. Existing national legislation (such as REACH in Europe, ChAMP in the USA) will dovetail with the overriding goal of a global product strategy for the chemical industry.



HUMAN BIOMONITORING PROJECT: FIRST RESULTS NOW AVAILABLE

The German Federal Environment Ministry (BMU) and the German Chemical Industry Association (VCI) embarked upon a cooperation in 2010. Its aim is to deepen the knowledge about substances which the population may possibly be exposed to more frequently or which may have a special health-related significance, but which are not yet measurable in the human body. It is often unclear to what extent the population is exposed to important industrial chemicals. All too often, there is no option but to make assumptions based on examples, which can easily lead to over- or underestimation of health risks.

Over the next ten years, analysis methods are thus to be developed for up to 50 jointly selected substances or substance groups and then applied in suitable studies. Developing these methods is a time - and cost - intensive process. The first results regarding human biomonitoring are now available: In the course of this project researchers have succeeded for the first time in developing analysis methods for the substances DINCH, DPHP and MDI. These methods are now being validated by the German Research Foundation (DFG). The substances concerned are used as plasticisers and as constituents of one-component foams for fixing and insulating window and door frames. The new methods will make it possible to test blood or urine samples for the presence of these substances.



The cooperation partners are continuing to work in parallel on developing further detection methods for other substances. They have now defined five more substances for which the first measuring methods are to be devised. In selecting the substances, BMU and VCI are supported by an advisory committee of high-calibre experts from academia, industry, and government agencies dealing with such topics. The new substances are the cyclic siloxanes D4, D5 and D6, geraniol and the blend of 3:1 chloromethylisothiazolinone / methylisothiazolinone. These are used - respectively - as cosmetic ingredients, a fragrance, and a preservative in industrial products and cosmetics.

BEING SUCCESSFUL WITH INNOVATIONS

SOLUTIONS FOR TOMORROW'S WORLD

The chemical industry in Germany develops innovations as answers to global challenges. It is one of the most innovative sectors in Germany.

The innovations of the German chemical industry cover manufacturing processes, products and applications, but also social aspects. Having innovations “made in Germany” in these areas is a prerequisite for competitiveness to ensure the long-term economic success of the sector.

Key role in meeting tomorrow's challenges

With its advanced materials, innovative pre-products and groundbreaking ideas, and with its expertise in how to apply its products, the chemical industry supplies inspiration in many different ways for innovations in all areas of sustainability. It therefore also spurs innovation in its customer industries.

The chemical industry addresses the global challenge of climate change with several different approaches. The first of these is reducing its greenhouse gas emissions per production unit. The second is creating products and applications which make it possible to use less energy or to capture renewable energies. Without products from the chemical industry, innovation successes such as electric cars, low-energy houses or the use of renewable energies would be inconceivable.

And innovations from the chemical industry also make an important contribution to

mastering further global challenges such as scarcity of raw materials, population growth and urbanisation in developing countries. Aspects involved range from assuring food security for a growing world population to the development of new forms of mobility to maintaining the health of an ageing population.

Driver for research and development

The chemical and pharmaceutical industry spent some nine billion euros in 2011 on research and development. It thus accounted for 16.8 per cent of all R&D expenditures by German industry as a whole and counts as one of the most innovative sectors of the economy. Just under 43,000 employees in Germany – that is, every tenth person working in the chemical industry – are engaged in this field. Since the global pressure to innovate is becoming more intense, it is essential to maintain good framework conditions so that Germany remains competitive as a research location in the coming years. The basis for this – even more so than in other sectors – is excellence in science and research as well as highly qualified personnel.

Scientific cooperation

Cross-sectoral cooperation in product development is becoming more intensive and closer. The number of innovation alliances is growing, not just between companies but

16.8%

of expenditures on R&D by German industry are accounted for by the chemical and pharmaceutical industry.

43,000

employees in Germany work in R&D in the chemical industry.



also between companies and scientific institutions. At the same time, international collaboration in research and development is assuming increasing significance.

For the chem-pharm industry in particular, excellent fundamental research is of enormous importance. Around one third of German chemical companies cooperate closely with both universities and non-university research facilities – not just in Germany but all over the world. There is also a growing trend towards interdisciplinary research.

Acceptance for innovations

The extent to which Germany can remain an innovation leader and one of the top exporting countries in the future hinges on social acceptance of technological progress as well as an open climate for innovation. Crucial to this is a culture in Germany in which opportunities and risks are assessed objectively and social groups are involved in a timely manner. This requires comprehensible and open communication touching on all aspects of new technologies. Only when politics, science, industry and society each make constructive contributions will it be possible to spark real enthusiasm for new approaches. The chemical industry therefore engages as early as possible in discussions on opportunities and risks of innovations, for example in the “NanoDialog” of the Federal Government.

Innovations in the social sphere

The innovative capability of the chemical industry also reaches into the social sphere. The industry develops pragmatic solutions to the demands of a changing working world and sets signals in terms of collective policies. The employers and the union have thus developed a special form of cooperation in their social partnership within the chemical industry which benefits companies and employees alike and helps to secure the long-term future of the chemical industry in Germany.

IEWS: FROM THE INDUSTRY
“NETWORKING AND COLLABORATION ARE THE BASIS FOR INNOVATION.”

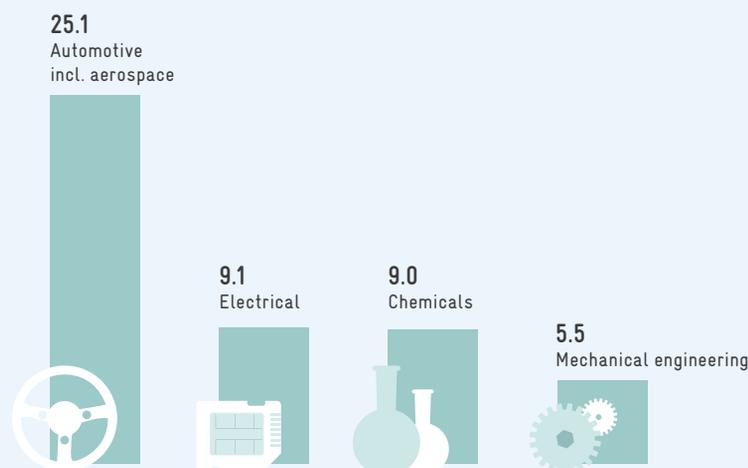


Dr. Stefan Scherer
Global Director R&D, Rockwood Lithium GmbH

“The existing structure of associations in Germany and the European Union is a good platform for cooperation between public and private sector research, thus effectively promoting new technologies. In recent years there has also been good progress made in terms of knowledge networking while at the same time safeguarding intellectual property. This is a necessary precondition for any joint work on innovations. This interdisciplinary aspect of cooperation is something we must further expand, especially when it comes to complex topics like recycling which requires expertise from a variety of specialist fields.”

RESEARCH AND DEVELOPMENT SPENDING

In billion euros



Source: Stifterverband (innovation agency for the German science system) 2012 for 2011

Health and Nutrition

BETTER QUALITY OF LIFE FOR ALL

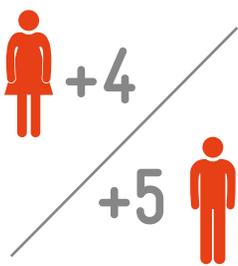
In 2050 there will be more than nine billion people living on this planet. How will we manage to meet the needs of the growing world population? Striving to provide good healthcare services and match the rising demand for food are just two of the many global challenges. The chemical industry is addressing these trends with innovative products covering all aspects of health and nutrition.





IN ACTION FOR HEALTH

ADVANCED ACTIVE INGREDIENTS FOR A BETTER LIFE



Rise in life expectancy in Germany to 82.5 years for women and 77.3 for men.

People in Germany are living longer. Since 1987 the statistical life expectancy of women has risen four years to 82.5. With an average life expectancy of 77.3 years, men are even living five years longer than they did then. This increase in life expectancy is due in no small part to the global pharmaceutical industry, considering that around 40 per cent of these additional years is due to the availability of better drugs (see graph at right). The industry also helps to improve the quality of life for many people with its products. The main areas concerned are detection, prevention, alleviation, curing and treatment.

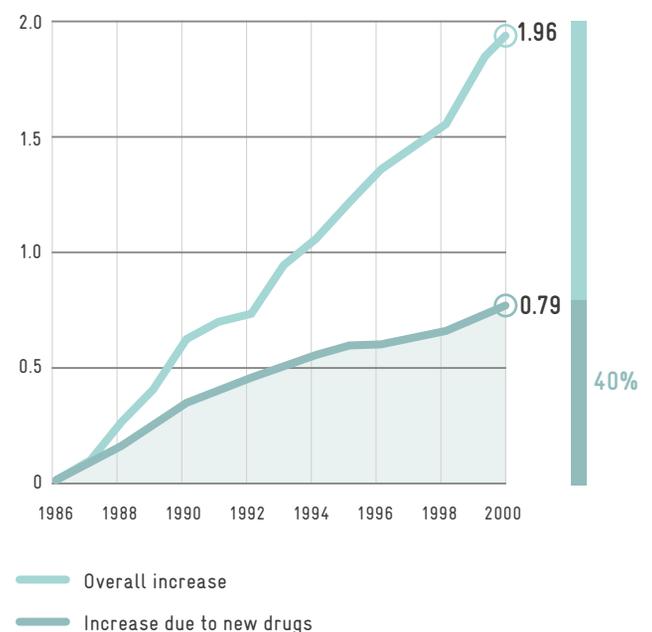
Detection: diagnostics and action mechanisms

Laboratory diagnostics are a core element of modern medicine. In two-thirds of all health examinations, laboratory tests play a key role. Using diagnostic agents and analytical systems, private-practice physicians and staff in hospital laboratories can perform tests on body fluids or tissue samples. This is essential, since without a proper diagnosis it is impossible to treat illness or diseases effectively. The earlier a disease is diagnosed, the better chances there are of alleviating its symptoms or curing it altogether, and at a lower cost.

Lab diagnostics – for example, to determine gene activity in healthy and diseased tissue – also play an important role in investigating the molecular processes involved in a disease. Understanding these processes is the first step in developing new drugs to treat that disease.

GLOBAL INCREASE IN LIFE EXPECTANCY THROUGH INNOVATIVE MEDICAL DRUGS

Percentage increase accounted for by new drugs.
Data from 52 countries around the world



Source: The Impact of New Drug Launches on Longevity, Frank R. Lichtenberg, 2005

Prevention:**vaccination against cervical cancer**

Prevention is the best medicine. Researchers have taken a huge innovative stride in developing vaccines against cervical cancer. After hepatitis B-induced liver cancer, this is the second type of cancer that can now be prevented by vaccination. The vaccine protects against the main strains of human papillomavirus (HPV) which can cause cervical cancer. Vaccination has been approved in Germany since 2006 and is recommended for young girls before first sexual intercourse. The vaccines are based on research by German Nobel prize-winner Harald zur Hausen.

Alleviation:**progress in treating rheumatism**

The industry is also constantly working on innovative products to improve people's quality of life and maintain their ability to work. One example is biopharmaceuticals – pharmaceuticals produced through genetic engineering using biotechnology – for rheumatism therapy. In some forms of rheumatism, the messenger molecules of immune cells play a major role. They cause other immune cells to attack the body's own tissue. Biopharmaceuticals intercept these messengers or prevent cells from noticing them. These drugs act against rheumatoid arthritis, the form of spinal rheumatism known as Bechterew's disease (ankylosing spondylitis) and other autoimmune conditions. German researchers participated in the development of the two most commonly used antirheumatic biopharmaceuticals.

Curing:**successes in hepatitis C research**

There are some 170 million people around the world suffering from liver disease due to the hepatitis C virus (HCV), which ultimately claims about 350,000 lives every year. In almost one quarter of those affected, the infection clears up by itself within a few months. If it persists, however, it can lead to chronic damage, such as cirrhosis or even cancer of the liver. Healthcare professionals use combination drugs to prevent such serious consequences and to cure the infection completely. After a standard therapy period of 24 weeks, about 80 per cent of HCV infections of subtype 2 or 3 (and since 2011, subtype 1 as well) can be cured in this way. To improve the chances of a cure still

VIEWS: FROM THE INDUSTRY
"DEVELOPING COUNTRIES NEED ACCESS TO SAFE DRUGS."



Friederike Segeberg
 Manager Public Affairs, Merck KGaA

"One of the challenges facing the pharmaceutical industry is enabling access to health. In developing countries there is not only a lack of safe drugs and healthcare solutions, there is also a great need for doctors and healthcare professionals to administer them.

This is why we are engaging in research and development on neglected tropical diseases (NTDs) and donating drugs to treat one of them, as well as focusing on measures to combat drug counterfeiting and to transfer knowledge."

SHARE OF PHARMACEUTICALS IN THE CHEM-PHARM INDUSTRY

Total turnover in billion euros

| | |
|-------------------------|-----------------|
| Chem-pharm industry | 184.2 |
| Of which: | |
| Pharmaceutical industry | 39.8 (21.6%) |

Number of employees

| | |
|-------------------------|--------------------|
| Chem-pharm industry | 428,650 |
| Of which: | |
| Pharmaceutical industry | 105,435 (24.6%) |

Source: German Federal Statistical Office 2012 for 2011

HIV/AIDS

Since the mid 1990s the mortality rate for HIV-infected people has dropped dramatically. Today, only one in forty people treated for HIV actually does develop Aids.

34 million people know their HIV status

2.5 million new HIV infections

1.7 million Aids-related deaths

Source: UNAIDS World Aids Report 2012

PARTNERSHIP FOR BETTER HEALTHCARE

The industry is also doing all it can to improve the situation in regions with insufficient healthcare services and to find innovative approaches for the health industry as a whole. One example is the "Making more health" initiative which was launched in June 2011 together with Ashoka, a global network of leading social entrepreneurs.

The initiative aims to enable better access to healthcare and treatment. It also supports programmes to overcome cultural and financial hurdles, lack of transport and educational gaps that stand in the way of improving healthcare.

► www.makingmorehealth.org

**Making
more
health**

further while shortening the therapy period and reducing the side effects, pharmaceutical researchers are developing other drugs which block the multiplication of the viruses in the liver cells.

Treatment:

HIV becomes a chronic disease

Whereas an infection with the Aids virus HIV inevitably led to death only 20 years ago, with appropriate treatment the disease now almost always takes a chronic course. Only every fortieth person treated for HIV actually does develop the immune deficiency called Aids. And HIV-positive mothers can almost always give birth to healthy children. This is possible because the pharmaceutical companies have been developing anti-HIV drugs since 1987 that include 25 different active ingredients, and because they have managed to reduce the number of tablets that had to be taken every day from more than 40 to sometimes just one. Nevertheless, HIV prevention is still the overriding priority. German scientists have been involved in developing a treatment to protect new born children of HIV-infected mothers.

A tough challenge:

Alzheimer's disease

The sector has developed effective drugs for many different kinds of diseases. And yet, for two thirds of all known diseases there is neither a cure nor any satisfactory way of treating them. One example is Alzheimer's disease. This form of dementia involves progressive deterioration of mental faculties accompanied by personality changes. As the disease typically occurs in old age – most of those affected are 80 or older – there will be more and more cases of Alzheimer's in Germany as a result of demographic change. Currently, four drugs have been approved for treatment of this condition. They can delay brain deterioration for a period of up to two years, but they cannot stop it. Pharmaceutical companies are therefore working intensively to develop and gain approvals for new drugs capable of halting the progression of Alzheimer's.

SECURING FOOD SUPPLIES

BETTER AGRICULTURAL YIELDS

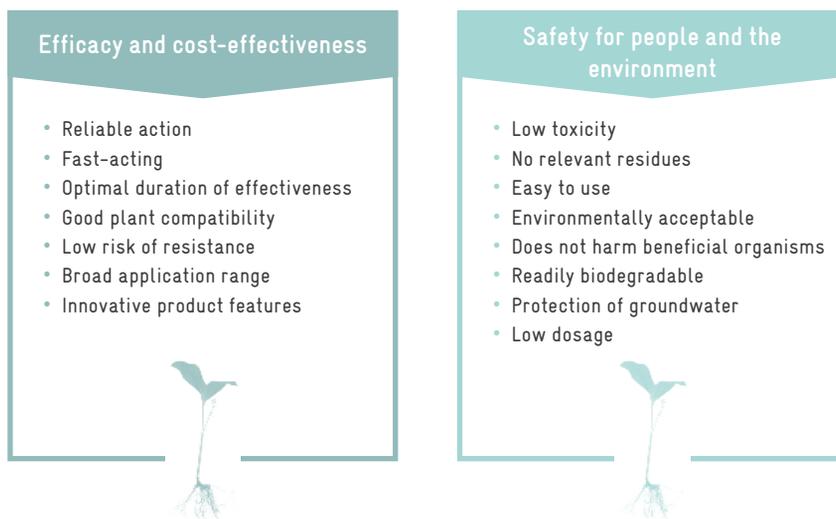
A rapidly growing world population needs significantly more food and agricultural raw materials in the future. But arable land is a limited resource on our planet. One of the most urgent priorities in agriculture is therefore to increase the yields from the same areas of farming land in an environmentally friendly way.

Modern farming methods help to increase crop yields. With responsible use of plant protection products and optimal fertilisation, farmers can double the yield for a given area compared to an untreated crop.

Safety for users, consumers and the environment

When developing new plant protection products, safety and environmental sustainability play a key role. On the one hand, the products must be highly effective against pests and plant diseases, yet they should also degrade rapidly in the environment and must not be harmful to human or animal health. It is essential to protect surface waters, the soil and biodiversity. This is the background against which the German plant protection industry, united under the umbrella of IVA (the German agrochemical industry association), implements specific stewardship projects. These include measures to promote the protection of surface waters, environmentally acceptable ways of disposing of packaging, or biodiversity topics such as the protection of beneficial creatures like bees.

DEMANDS MADE ON A PLANT PROTECTION PRODUCT



Source: IVA (the German agrochemical industry association), "Modern Plant Protection", 2013

New approaches in plant breeding

In order to meet the future demand for food and renewable resources worldwide, innovations are called for in fertilisers, plant protection, classical and modern plant breeding.

An important element here is plant biotechnology. For the chemical industry, plant biotechnology is one of many contributions to increasing crop yields in agriculture and ensuring the supply of renewable resources. As a key technology it opens up new approaches. One thing is sure: demands placed

VIEWS: FROM THE INDUSTRY
"FISH FEEDS THE WORLD,
WE FEED THE FISH."



Dr. Christoph Kobler
 Director Product Management Aquaculture Health & Nutrition, Evonik Industries AG

"Fish is the most important source of animal protein for people around the world. Given the growing global population and rising demand, industrial fish farming must be made more sustainable, and we manufacture methionine sources to help fish to digest their food better. Since prawns eat much more slowly than fishes, we have developed a new product that is specially adapted to their eating habits and digestive tract. It helps them to grow in a healthy and efficient way, while also conserving resources."

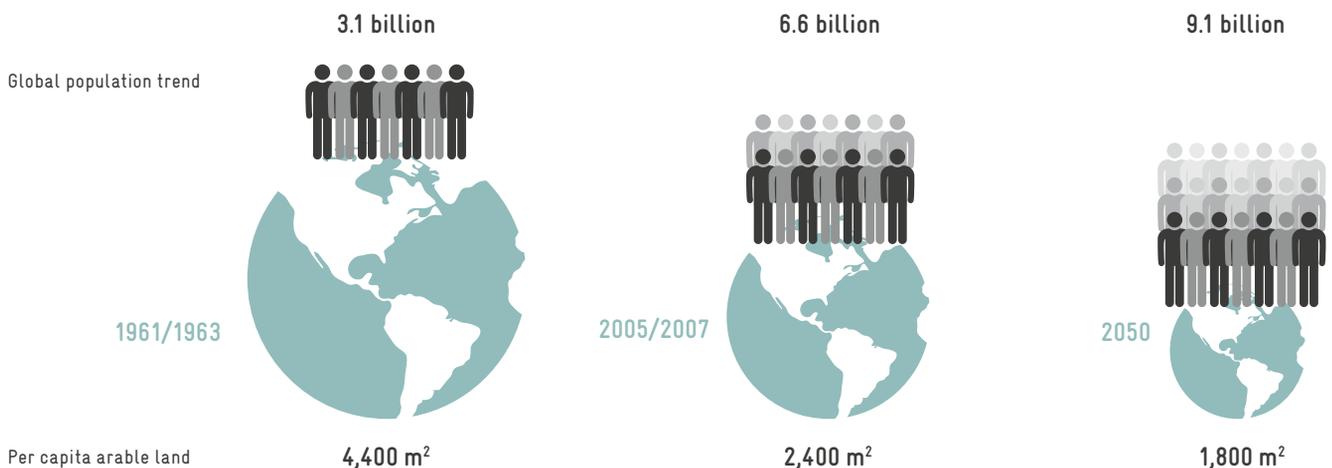
on crops will increase in the future. This is particularly true of those regions affected by increasing aridity. New varieties such as drought-tolerant types of maize, rice or wheat will play an important role in coming years.

Plant biotechnology is a hotly debated topic in Europe. Critics fear that genetically modified plants may pose risks for humans, animals and the environment. However, the enterprises themselves and the regulatory authorities assess the safety of the plants in regard to these aspects. Since the beginning of commercial cultivation of such plants in the year 1996 there has been no evidence of any adverse effects on human health, animal health or the environment. Biotechnological products that have been approved by public authorities are safe.

Hidden hunger

Worldwide, around one billion people are suffering from famine. But this is only part of the problem. Less well known – because it is not immediately visible – is the hidden hunger of nutritional deficiency. This has assumed dramatic proportions: two billion

GROWING POPULATION – LIMITED ARABLE LAND



Source: Food and Agriculture Organization of the United Nations (FAO), 2012

people, almost one third of the global population, are affected. They are not receiving adequate amounts of vitamins or minerals. Vitamin A deficiency is especially widespread. People with a vitamin A deficiency can become blind or contract infections more easily as their immune system is weakened. This problem is particularly prevalent in developing and emerging countries.

The German chemical industry and its development aid partners are working to solve this problem through a process known as fortification. This means adding vitamin A, for example, to affordable staple foods such as edible oil and flour, thus ensuring that even low-income groups are provided with these essential micronutrients.

Making water drinkable

Almost one billion people around the world have no access to clean drinking water. This inevitably results in frequent illnesses and higher mortality. Diarrhoeal diseases are the second most common cause of death in children under the age of five and claim the lives of 1.5 million infants each year. More children die of diarrhoeal diseases than of

Aids, malaria and measles combined. The need for effective and low-cost ways of producing clean drinking water is therefore very high.

One solution is the materials developed by the chemical industry for portable water filters with which people in the affected regions can clean their water themselves. They thus have an opportunity to improve the quality of drinking water locally, at the place it is to be used in, and do not have to rely on centralised water treatment systems. This also reduces the risk of contamination during filling or transport. Such systems remove viruses and bacteria originating from contaminated surface waters, doing so reliably by microbiological means without the need for electricity, chemicals or any sophisticated technology.

VOICES: CHEMIE³ IN DIALOGUE "BIOTECHNOLOGY IS ONLY ONE LIMITED POSSIBILITY."



Bettina Locklair
Catholic liaison office of the German
Bishops' Conference

"The challenges facing us with respect to the growing world population and how to feed it are, indeed, manifold. But the solutions are just as varied. Biotechnology is, if at all, just one very limited possibility which has not yet delivered on its

promises. Plant protection and fertilisers have always been part of a farmer's work.

The main question is which product to use, in what quantity, and what effect it will have on nature and the environment. Before technology is used, other aspects have to be considered first: Which plant is actually the right one for that particular spot? How can the soil quality be improved and not deteriorated by the type of cultivation and the crops chosen? How can we humans reduce the amount of land we use? In many discussions, representations and entrepreneurial decisions there is a lack of awareness that the technological achievements that have been employed to date are also part of the problem, and sometimes even the cause of it. Technology must be incorporated into the cycle of nature and of people, into traditions and traditional knowledge – it can only ever be an aid."

Energy and Raw Materials

RENEWABLE ENERGIES – REDUCED RESOURCE CONSUMPTION

UN Secretary General Ban Ki Moon has declared the goal of doubling the share of renewable energy in the global energy mix to 32 per cent by 2030. With its “energy turnaround” project of the century, Germany has set itself especially ambitious targets for expanding the use of renewable energies. The chemical industry is making an important contribution in this area. But it also plays a key role – both as a user and a solution provider – in meeting the goal to use finite resources, such as mineral oil, industrial minerals, rock materials, and precious metals, more efficiently.



CAPTURING RENEWABLE ENERGIES

ELECTRIC POWER FROM THE SUN, WIND AND HYDROGEN

The world is facing the challenge of putting a cap on carbon dioxide emissions. At present, however, alternative energy solutions such as solar power, wind energy or bioenergy are approaching their limits in terms of efficiency and technical feasibility. The chemical industry is therefore working on solutions which will make it possible to generate, store and transmit electric power more efficiently.

Wind power: expanding the capacities

With a target of some 50 per cent defined by the Federal government, wind energy is to play a key role in the power mix in Germany by 2050 and thus form the backbone of the energy turnaround. This requires a massive expansion of wind power capacities. Offshore wind farms are of special significance here. Such farms present huge technical challenges to manufacturers. On the one hand, the wind turbines themselves must be much larger than those on land in order to cover the considerable extra cost for erecting them, connecting them to the grid and operating them efficiently. On the other hand, offshore turbines have to be much more weather-re-

sistant as they are exposed to solar UV radiation, rain and wind. All of this demands new materials, which can only be made with chemistry. For example, the chemical industry is working on polyurethane-based coatings to make surfaces especially weather-resistant.

Solar power: boosting efficiency levels

Germany is among the leaders when it comes to developing and propagating solar power technology. The chemical industry is working to increase the efficiency levels of solar cells and reduce the manufacturing costs. Both these goals can be achieved by using solar cells made with crystalline silicon, which make up most solar modules. Chemistry is also needed for the second generation of solar modules, the thin-film solar cells. Currently, the chemical industry is researching the third generation: organic photovoltaics based on semiconductor polymers. Since the solar cells of the second and third generation can be printed on plastic sheeting, new applications will be opened up – for example, installation on house walls to generate electricity in the

50%

is the planned share of wind energy in the power mix by 2050.



WIND TURBINES: BUILDING LONG ROTOR BLADES WITH CHEMISTRY

The development of wind turbines has progressed considerably in the last few decades. Since 1980 the diameter of the rotors has become more than eight times larger, from 15 metres then to 126 today. Rotor blades are becoming longer because a blade twice the length can sweep an area that is four times larger, thus capturing four times as much energy. At the same time, a blade that size is also four times as heavy, and a 60-meter blade weighs just under 20 tonnes. The hubs used to attach the rotors are installed at increasingly high levels of up to 135 metres. As the dimensions grow, so do



the demands made on the materials used. Chemical materials have therefore become important components of wind turbines as they are lighter than other materials and weather-resistant as well. Rotor blades, for example, are made from fibre-reinforced composites based on epoxy resins. The advantage is that they are especially lightweight yet robust and flexible. To make rotor blades even more efficient and durable, chemists are working on composite materials reinforced with carbon. These contain carbon nanotubes that are 3,000 times thinner than a human hair, four times lighter than steel but five times stronger.

The chemical industry takes the safety of its products seriously and is aware of its responsibility regarding nanotechnology as well. For this reason, the industry is not only conducting its own research into safety but also participating intensively in external research projects on a German, European and global level. In order to support manufacturers and customers in handling nanomaterials safely, VCI has developed additional guidelines and recommendations on the safe use of nanomaterials for its members, as part of its Responsible Care programme. With these guidelines the chemical industry is taking account of the "Five Principles" of the German government's NanoDialogue.

home or application to schoolbags and sports apparel, to power digital devices such as mobile phones.

Fuel cells: high-efficiency energy capture

Hydrogen is seen as an energy storage medium for the future: The chemical energy stored in the hydrogen contained in hydrogen fuel cells can be converted directly into electric power and hot water with a very high degree of efficiency. The only by-product is water vapour. Since fuel cells can be manufactured in different sizes and designs, they can be used in a wide range of applications. As an individual power unit installed in a cellar or as a large combined heat and power station they can provide electricity for a home or a complete residential district. Other conceivable uses are in mobile phones or as drives for electric cars. Research engineers in the chemical industry are busy investigating components such as electrodes or membranes to ensure reliable functioning and long life of the equipment at an affordable cost. However, the precondition for a truly low-carbon fuel cell is that hydrogen should not be obtained

from fossil energy sources but from regenerative sources such as solar power.

Saving energy with chemical products

In addition to the above, the chemical industry also produces numerous products which save energy while they are being used. Over their life cycle they save more than twice the greenhouse gas emissions that arise during their production, application and disposal. Products like these include insulating materials for houses or materials for efficient light sources such as LEDs. (For more information, see the section on "Advanced materials".)

CONSERVING FINITE RESOURCES

EFFICIENT USE OF RAW MATERIALS THROUGH INNOVATIONS IN CHEMISTRY

137.6

billion euros spent on raw materials imports to Germany.

Underground natural resources on this planet are limited – this applies to fossil energy carriers such as oil, coal and gas as well as industrial minerals, metals, rock and earth materials, and precious metals. However the demand for them is rising steeply due to the economic development of emerging markets, the growing world population and the high requirement of industrialised nations. Per year, more than 60 billion tonnes of raw materials are consumed – 50 per cent more than 30 years ago. If this trend continues, there is a danger that some raw materials will soon no longer be available in sufficient quantities or at affordable prices. Even now, the first impacts of shortages are being felt with the increase in world market commodity prices. The chemical sector is therefore making every endeavour to extract the greatest possible volume of product from every tonne of raw material – not least, for cost reasons.

High dependency on commodity imports
Germany imported raw materials amounting to a value of 137.6 billion euros in 2011. The raw materials produced in Germany came to

20.3 billion euros. There is thus a high dependency on states and regions with large deposits such as the Middle East and Russia. Moreover, mining of raw materials such as rare earths is concentrated in just a few countries. 95 per cent comes from China, while 90 per cent of the platinum is sourced in South Africa and Russia.

Oil and gas, the most important resources today for the carbon needed for organic chemistry, are finite. The chemical industry in Germany is therefore focusing more on renewable raw materials whenever this is technically and economically advantageous. Currently, about 2.7 million tonnes of these are being used every year. However, at 60 to 70 per cent, there is also a dependency on imports for renewable raw materials as well.

Using resources efficiently

In the German chemical plants, the raw materials are used to make more than 30,000 products. To produce organic products, they need around 21 million tonnes of carbon-containing raw materials per year. The chemical industry is developing new



IN FOCUS

PROTECTING PRECIOUS WATER

Clean drinking water is a dwindling resource around the world – and one which will become ever more important as the global population continues to grow. Sustainable use of water and worldwide protection of natural water resources are therefore important goals for the chemical industry. With its expertise and innovative water treatment products, the chemical industry offers solutions to these challenges. Many products help to save water and to prevent or eliminate water contamination.

Ion exchangers and adsorbers remove arsenic, nickel and nitrate from polluted water and make it usable again. In industry, they are also used to treat process water and clean waste water, thus avoiding water pollution. In addition, high-performance rubber materials help to save water, as seals in containers or between moving machine parts in order to transport liquids from one place to another without losses.

processes for increasing product yield and catalysers to reduce the energy input. An example: when by-products are generated during reactions, these are used as feedstocks for other processes. With this kind of integrated production setup, the chemical industry can work extremely efficiently. This idea of integration is also applied in the roughly 60 German chemical parks where companies achieve synergistic effects by sharing energy, raw materials and intermediate products and also the use of plants and equipment. As a result, raw material usage in the industry rises and falls mainly at the same level as the output. In 1964, for example, it took 1,185 kilograms of raw material to make 1,000 kilograms of polypropylene, which is used to make children's seats or yoghurt cups. In 2005, only 1,005 kilograms of input materials were needed, and the physical efficiency limit – the minimum amount of starting materials required for production – has been virtually reached.

Raw materials are being used much more efficiently today: from 1995 to 2007, the waste per tonne of raw materials used fell from 115 to about 20 kilograms. The chemical industry has therefore reduced its waste footprint to one-sixth, with the result that today 98 per cent of the raw materials used are converted to products and energy.

Second-generation renewable raw materials

To reduce carbon emissions and the dependency on fossil raw materials, enterprises are also researching the production of bioethanol from plant residues containing cellulose. Plants are renewable raw materials which, when combusted, release only the quantity of carbon dioxide which they have stored during their life. In a demonstration plant in Bavaria, trials are currently being successfully conducted to produce large volumes of bioethanol from straw. The biotechnological process used here has several advantages: it saves 95 per cent CO₂ and does not compete with food production, since straw is an agricultural residual.

VOICES: CHEMIE³ IN DIALOGUE "REQUIREMENTS HAVE BECOME MUCH MORE COMPLEX."



Prof. Dr. Rainer Grießhammer
Management board member, Öko-Institut e.V.

"Resource efficiency is a strategy inherent to chemists. Even as students in the lab, they try to get the highest yield they can. But the requirements have become much more complex. First of all, the chemical industry must ensure that solutions are found for conflict raw materials – whether palm oil from cleared rainforest or metals from the Congo, for instance. Secondly, it must support its customers in saving resources in production and use. Thirdly, the chemical industry must pursue a future-oriented raw materials strategy and develop new waste management and recycling processes. And finally, it must find integrative solutions. As before, a top priority is reducing the impact on people and the environment due to problem chemicals and finding substitutes as quickly as possible for the substances of very high concern (REACH Art. 59)."

VIEWS: FROM THE INDUSTRY "WATER IS MORE IMPORTANT THAN EVER."



Dr. Linda von dem Bussche
Senior Vice President – Environment & Permits, BASF SE

"Responsible management of water resources is very important to us. We have therefore set two global targets: The first one is to reduce the use of drinking water in production processes by half by 2020 relative to 2010. Achieving this target will require a great many individual measures, such as using surface waters instead of drinking water, utilising condensed steam for washing and rinsing operations, and cascading water in closed circuits. Our second global target for 2020 is to audit all our production sites in water stress areas for sustainable water management practices and to apply the voluntary industry standard known as the 'European Water Stewardship Standard'. These two targets may sound simple, but they are a real challenge at the global level."

Advanced Materials

LIVING COMFORTABLY THANKS TO ADVANCED MATERIALS

All over the world there are growing expectations on mobility and the surroundings we live and work in. Energy is assuming ever greater importance. This is a trend that poses complex challenges: can energy be produced and used so efficiently that we can at least maintain our standard of living even while using less energy?





GIVING PEOPLE MOBILITY

SOLUTIONS FOR LOW-EMISSION DRIVE SYSTEMS

1.4

billion cars will be on the roads around the globe in 2020.

The world is becoming more and more mobile. It is not just in Germany that traffic continues to increase. Emerging markets such as China and India are also experiencing booms. The number of vehicles is expected to rise by 300 million units worldwide by 2010. There will be 1.4 billion cars on the roads then. While this trend certainly promises a better quality of life for many people, it calls for even more care to be taken, especially with fossil raw materials.

Although combustion engines are becoming more and more fuel-efficient, the absolute consumption of fossil raw materials and the carbon emissions are steadily rising with rising numbers of cars. Along with regenerative energies, the expansion of electromobility is thus an important factor for reducing carbon emissions in the transport and traffic sector. Other methods are the further development of low-emission technologies, such as fuel cells, hybrid technologies and highly efficient combustion engines.

One of the greatest challenges in switching to electrically powered drive systems – whether purely battery powered or hybrid drives – is and remains energy storage. A higher energy storage capacity and lower consumption rates, both of which increase

the range of electric cars, are crucial in determining usage possibilities, price and ultimately the acceptance of electromobility. The chemical industry makes many contributions that will help to achieve rapid advances in electromobility and make it fit for daily use.

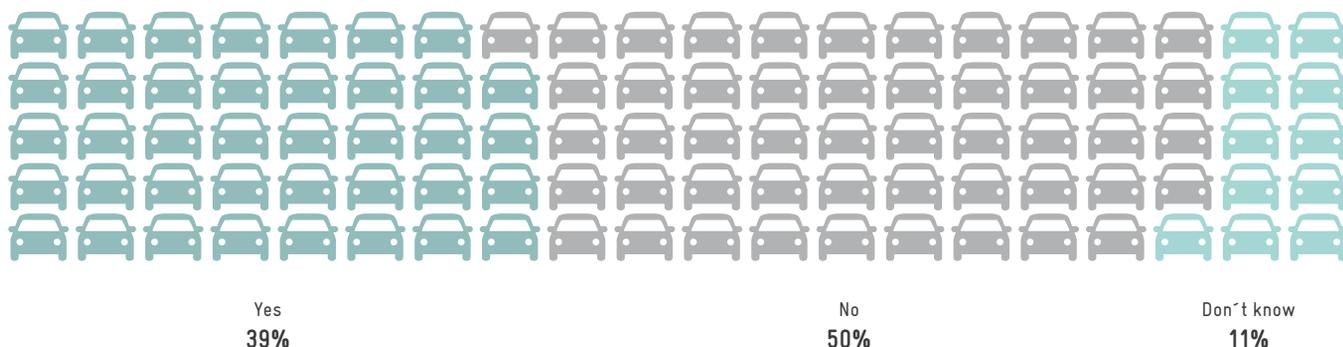
Wider range thanks to latest-generation batteries

The development of high-performance batteries is the key to success for new, environmentally friendly drive systems. It is due to lithium technology, for example, that we have batteries today with properties that hardly seemed feasible even 20 years ago.

The chemical industry collaborates intensively with research establishments on developing the next generation of automotive batteries. Even today, electric cars can achieve a range of around 150 kilometres per battery charge. The next battery generation promises to bring significant technical advances. Research is being conducted not only to improve current lithium ion batteries but also to design new kinds of lithium systems in which sulphur or atmospheric oxygen are to be paired with the lithium as reaction partners. The storage capacity of this new battery technology could be many times more than that of existing batteries.

ACCEPTANCE OF ELECTRIC CARS

When asked whether they could imagine buying an electric car in the next three years, the responses were:



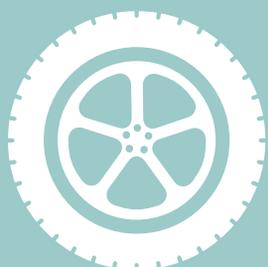
Source: Forsa market research institute, 2012

Lowering energy consumption through innovative composite materials

Just ten years or so ago, most of a car body consisted of metal. By using new plastics it is possible to save a considerable amount of weight in automobile construction. Lighter cars need less energy, no matter whether this comes from petrol or an electric source.

FUEL-SAVING TYRES

New materials reduce the rolling resistance of tyres and save between five and eight percent fuel, or other forms of energy. These tyres nevertheless offer good road-holding performance and long life.



Up to **8%**
less fuel consumption
thanks to fuel-saving tyres

VOICES: CHEMIE³ IN DIALOGUE

"THE AUTOMOTIVE INDUSTRY RELIES ON INNOVATIONS FROM THE CHEMICAL SECTOR."



Prof. Dr. Gerhard Prätorius

Head of CSR and Sustainability, Volkswagen Group

"The automotive industry relies on innovative solutions and new kinds of materials from the chemical sector in many different areas, ranging from fuel-saving tyres to advanced materials for lightweight construction. Both manufacturers and customers have high expectations regarding the environmental compatibility of these solutions, such as the recyclability of electric batteries. In my view, a sustainability initiative by the chemical industry should be aimed at intensifying cooperation between industrial sectors to find convincing overall solutions – for example, for CO₂-neutral mobility."

SAVING ENERGY WITH ADVANCED MATERIALS

SUSTAINABLE HOME COMFORTS

3x

more energy is needed to heat unrenovated buildings compared to new ones.

Achieving Germany's energy targets is a task for all members of society. Everyone can contribute here, whether at work or in their home environment. The chemical industry develops products that are designed to help people to use energy more efficiently, while improving their quality of life.

The biggest energy-saving potentials in Germany are to be found in the buildings. Unrenovated old buildings need about three times more energy to heat them than new buildings. In Germany, more than 50 per cent of all residential units are not adequately insulated. If these housing units were insulated with rigid foam polystyrene panels, the fuel oil consumption per square metre could be cut by up to two-thirds. That is kind to the wallet and the environment. Through insulation and further measures, the carbon dioxide emissions of households in Germany due to heating have been reduced by over 60 million tonnes per year.

Modern windows also help to save a great deal of energy. To ensure that heat is not dissipated through them, the cavities between the panes of double- or triple-glazed windows contain inert gases from the chemical industry. Sealants ensure that the gas cannot escape and no moisture can enter the cavity. If moisture does happen to penetrate, it is bound by a desiccant. Besides this, plastic frames also act as heat insulants, especially when the cavities inside the profiles making up the frame have been filled with foam.

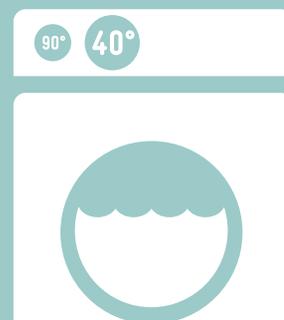
Chemical products in plaster or in drywall panels have the same effect as air conditioners, only without the high energy consumption. Tiny plastic balls filled with ultrapure

CLEVER HELPERS IN THE HOME

Low-temperature laundry detergents

Chemistry also creates energy-saving opportunities in the home as well. For example, optimised laundry detergents today achieve the same cleaning results at 40 °C that used to need a temperature of 90 °C. A 40 °C wash cycle uses almost 70 per cent less electricity than a 90 °C cycle. This is in part due to the use of modern enzymes which efficiently remove protein, fat or starch-based stains from fabrics. They even make it possible for low-temperature detergents to remove stains at washing temperatures below 30 °C.

By choosing lower washing temperatures, it would generally be possible to save about one terawatt hour of electricity per year in Germany. This is equivalent to the annual electricity consumption of 286,000 households in Germany.



paraffin wax ensure that walls absorb a large part of the heat on sunny days before the interior of a house becomes too warm. At night, they then dissipate the heat to the environment again. Another way of increasing energy efficiency is to use heat-reflecting interior paints and coatings. These reflect some 39 per cent of the heat radiated in a room, while the figure for conventional paints and coatings is only 5 per cent. Simply using an appropriate paint product can save up to 20 per cent energy.

Corrosion protection with paints and coatings

The Eiffel tower is Paris's most famous symbol. But without the help of chemistry, this structure would have a very short life expectancy. The tower is namely repainted every two to three years using a special kind of paint – produced by the chemical industry – to protect it against corrosion. The most important function of paints and coatings is to protect structures like this, as well as bridges, vehicles, and industrial goods of all kinds.

In past years, heavy metals such as lead and chromium have already been successfully eliminated from the corrosion-protection formulations and replaced by more environmentally acceptable metal compounds. A main priority for the future is to reduce the emissions of organic solvents (VOCs) still further. This can be done by using water-borne coating materials, or with high-solid systems which have a solvent content of only around 30 per cent, instead of up to 60 per cent in regular products.

New light

An alternative to energy-saving light bulbs are LEDs and OLEDs. Compared to conventional filament light bulbs they save up to 90 per cent energy. LED lamps are based on inorganic semiconductor materials and can be produced in many different shapes and varieties. Research is also being conducted into OLEDs, which are based on organic semiconductors. They emit a warm, comfortable light and in lighting technology they are suitable for large-surface light sources.

VIEWS: FROM THE INDUSTRY

“PLASTICS ARE THE MOST SUSTAINABLE SOLUTION.”



Stephanie Boos
Account Manager, Dow Germany

“Modern packaging materials made of plastics achieve a great deal. They can keep food fresh longer or ensure hygiene in medical products. They also reduce carbon emissions during transport because they are lighter than other materials. Despite this, many people still think plastic packages are bad for the environment. But if you take a closer look, it soon becomes clear that plastics are often the most sustainable solution.”

IN FOCUS

LEDs AND OLEDs

While almost everyone is familiar with LEDs by now, OLEDs are still relatively unknown. They are even lighter and more versatile than LEDs. They are used to meet exceptional demands in terms of colour and design, such as for the displays of smartphones or notebooks. Unlike LEDs, the lighting substances in OLEDs are based on organic chemical compounds, whereas LEDs generally use inorganic gallium.



SUPER SUSTAINABLE

GUEST COMMENTARY BY WOLFGANG LOTTER



Wolf Lotter

Born in 1962 in the Austrian town of Mürzzuschlag (Steiermark province), Wolf Lotter lives and works in Hamburg and Berlin as a freelance journalist and author. He is a co-founder of the German business magazine "brand eins" and is held to be "Germany's most sharp-tongued business essayist" (Der Journalist).

Anyone who grew up speaking German in the Seventies said "super" at least fifty times a day. It was the most important word in the world. The latest band, bell bottoms, psychedelic wallpaper, ice lollies, the new girl in class – they were all super. You also said super even when things were definitely unsuper, totally boring, and there was absolutely nothing to write home about. You said super because everyone else did. Truly super.

Today, super is out. It's old-fashioned and doesn't seem to fit in an age where people spend more time talking about problems than how to solve them. But super has found a worthy successor: sustainable. Sustainable is the new super.

And the word inflation rate has not lessened at all. Quite the reverse, in fact. Just for fun, one could spend a day counting how many times the word is used – and also noting the context. It's everywhere: in mails, print materials of all kinds, on the radio and TV, it's practically endemic on the web and crops up repeatedly in company memos. There's no escaping it. That's a huge victory for sustainability. Nobody can get by without a sustainable this or that.

But disenchantment is creeping up on us. Today everything is just as sustainable as it was super in the Seventies. People don't really mean it. It's just a game.

But there is a time for playing and a time to be serious. And sustainability is a serious business which definitely does not deserve to be belittled by buzzwording. Because sustainability consists of a series of ingredients that are all hard currency – things one should not treat lightly.

What does sustainability actually mean? On the surface, it simply describes a process in which one not only takes action but considers the consequences of that action. It is not just a question of thinking about things, but also of thinking ahead. What will be the impact of a decision, a method, a product or an action on other current and future developments? Resources and their future availability are not the only considerations here. There is more to it than wondering whether we leave the world a better or a worse place to live in for future generations. It is also not just a question of seeing the market economy as a long-term system in which instant gratification of wishes is not always the best idea. Thinking is always sustainable.

And Francis Picabia's maxim is one that we would do well to remember especially in difficult times like these: Our heads are round to let thought change direction.

Sustainability cannot mean anything else but to think in terms of possibilities, different options, multiple answers, and not simply believe in finding one single answer that will be valid for all time. There is more than one solution to a problem, and there is more than one side to it. So the first lesson is to stop thinking of sustainability as a relentless, rigid worldview and to see it as a process: in the long term, the wisest approach is to regularly revisit and rethink ideas. And also review one's own attitude, and question whether a position taken in the past is still tenable.

In the Western affluent societies, such questions have been raised with increasing frequency in recent decades with respect to the industrial sectors based on science and engineering. Chemistry and energy, equipment and machinery have lost their decades-long status as the trusted security blanket for progress in which all will go well for most people. They are often viewed with a critical eye and their actions are sometimes even perceived as a threat. The rich consumer societies which emerged after the Second World War now distrust the foundations of their success. But a complex world rests on complex methods and processes. Nevertheless, even while ensuring good living, the paraphernalia are seen as irksome and unnecessarily complex. Ever since the Sixties people have been asking questions about the need for it all. All too often, the experts avoided the issue, saying: "a layman wouldn't understand", the

standard euphemism for "that's none of your business." In an information society, that phrase is poison. The chemistry has definitely gone sour. The irksomeness has turned into suspicion. When that sets in, a stalemate is not far off. One side refuses to tell, the other doesn't want to hear. What to do in an impasse like this? The answer is obvious:

Become truly sustainable. What does this entail? The kind of sustainability that looks ahead and switches to dependable, understandable problem-solving. A pragmatic approach to sustainability which gets results and shows what it can do, which creates the space for possibilities – but one which also throws the ball back to civil society with the appeal: "Make up your own mind, citizen." Just being against something is not enough. Saying no is the prerogative of people who are not interested in the future, either because they don't have one themselves or because they are perfectly happy with what they've got. If that's the case, they should say it plainly: leave us in peace.

But the future needs more than peace. It needs perspectives, solutions, views. To get there you have to talk, learn from one other and adopt the fundamental principle underlying the knowledge society: you have to want to share with others.

What more could one ask? Sustainability is super when it creates perspectives, and turns problems into solutions. To do that you have to talk, learn from one other and do what the knowledge society does best: promote everything that helps people to share. That is true sustainability.

And only that kind is truly super.

“Sustainability is not a relentless, rigid worldview, but a process: in the long term, the wisest approach is to regularly revisit and rethink ideas.”

THE CHEMICAL INDUSTRY IN FIGURES

| Indicator | 2011 | 2000 | Source |
|---|---------------------|-----------------|---|
| Economic indicators | | | |
| Turnover | 184.2 bn € | 135.0 bn € | German Federal Statistical Office |
| Turnover from export sales | 109.1 bn € | 67.7 bn € | German Federal Statistical Office |
| Value added | 52.4 bn € (2010) | 40.1 bn € | German Federal Statistical Office |
| Investments in tangible assets in Germany | 6.2 bn € | 6.8 bn € | German Federal Statistical Office |
| R&D expenditures | 9.0 bn € | 7.1 bn € | Innovation agency for the German science system |
| Number of employees in R&D | 42,712 | 46,210 | Innovation agency for the German science system |
| Social indicators | | | |
| Employees | 428,650 | 470,308 | German Federal Statistical Office |
| Age pyramid | | | Federal Employment Agency, BAVC, as at 31 Dec. |
| < 25 years | 8.1% | 8.5% | |
| 25–39 years | 28.5% | 41.1% | |
| 40–49 years | 33.2% | 27.9% | |
| 50–59 years | 25.6% | 19.9% | |
| ≥ 60 years | 4.6% | 2.5% | |
| Qualifications structure | | | Own surveys/extrapolation by BAVC 2011 |
| University graduates | 16% | | |
| Master tradesmen/chemical/engineering technologists/chem-pharm commercial specialists | 13% | | |
| Skilled workers | 56% | | |
| Semi-skilled/unskilled workers | 10% | | |
| Apprentices | 5% | | |
| New apprenticeships | 9,440 | 8,542 (2003) | Own survey by BAVC |
| Remuneration per employee | 52,511 € | 41,742 € | German Federal Statistical Office, BAVC |
| Accident rate | | | German Social Accident Insurance Institution for the raw materials and chemical industry |
| Occupational accidents (per million hours worked) | 9.5 | 13.6 | |
| Fatal occupational accidents (per million hours worked) | 0 | 5 | |
| Share of women among employees | 32.3% | 29.6% | Federal Employment Agency, as at 31 Dec. |
| Companies offering on-the-job training | 92.5% (2010) | – | Cologne Institute for Economic Research, BAVC special evaluation (chemical, pharm, rubber and plastics processing industries) |
| (All economic sectors) | 83.2% (2010) | – | |
| Costs for on-the-job training per employee | 1,467 € (2010) | – | Cologne Institute for Economic Research, BAVC special evaluation (chemical, pharm, rubber and plastics processing industries) |
| (All economic sectors) | 1,035 € (2010) | – | |

| Indicator | 2011 | 2000 | Source |
|---|--------------------------------|---------------------|---|
| Environmental indicators | | | |
| Energy consumption | 654,742 TJ | 727,089 TJ | German Federal Statistical Office, VCI |
| Energy consumption per product unit (Index 2000 = 100) | 87.1 | 100.0 | German Federal Statistical Office, VCI |
| Greenhouse gas emissions, absolute (energy-related carbon emissions + laughing gas emissions) | 45.7 m t | 50.7 m t | VCI monitoring for voluntary climate protection commitment, German Federal Statistical Office |
| Greenhouse gas emissions per product unit energy-related carbon emissions + laughing gas emissions, Index 2000 = 100) | 74.6 | 100.0 | VCI monitoring for voluntary climate protection commitment, German Federal Statistical Office |
| CO ₂ emissions, absolute (energy-related carbon emissions) | 44,5 m t | 44,1 m t | VCI monitoring for voluntary climate protection commitment, German Federal Statistical Office |
| CO ₂ emissions per product unit (energy-related carbon emissions, Index 2000 = 100) | 83.4 | 100.0 | VCI monitoring for voluntary climate protection commitment, German Federal Statistical Office |
| Use of water (in billion m ³) | 2.72 | 3.31 | VCI Responsible Care inventory |
| Release to the air (in thousand t) | (2010) | (2007) | Federal Environment Agency, VCI The data collected from 2000 to 2007 based on the VCI Responsible Care surveys are based on a different statistical universe and are therefore not comparable with the data of the Federal Environment Agency. |
| Nitrogen oxides (NO _x) | 19.4 | 20.1 | |
| Volatile organic compounds (NMVOC) | 9.4 | 10.4 | |
| Sulphur oxides (SO _x /SO ₂) | 16.5 | 15.9 | |
| Release/discharge to surface waters (in thousand t) | (2010) | (2007) | |
| Total phosphorus | 0.22 | 0.24 | |
| Total nitrogen | 5.2 | 6.5 | |
| Adsorbable organic halogens (AOX) | 0.10 | 0.11 | |
| Chemical oxygen demand (COD) as total organic carbon (TOC) | 10.8 | 12.0 | |
| Waste for disposal of which, hazardous waste | (2010) 0.83 m t 0.45 m t | - - | |
| Waste for disposal of which, waste to be monitored (definition at that time) | - - | 2.4 m t 0.91 m t | VCI Responsible Care inventory |
| Transport and logistics Accidents per million t of chemicals transported | | | VCI Responsible Care inventory |
| Road | 0.95 | 0.95 | |
| Rail | 0.07 | 0.27 | |
| Inland waterways | 0.10 | 0.21 | |
| Sea | 0.13 | 0 | |
| Environmental protection investments | (2010) | | German Federal Statistical Office |
| End-of-pipe environmental protection | 128 m € | 337 m € | |
| Integrated environmental protection | 99 m € | 149 m € (2004) | |
| Operating costs for environmental protection | 1.9 bn € | 2.5 bn € | German Federal Statistical Office |

All figures relate to the chemical-pharmaceutical industry, unless otherwise stated. All sector-specific figures in the entire text relate to 2011, unless otherwise stated.

GUIDELINES

ON SUSTAINABILITY FOR THE CHEMICAL INDUSTRY IN GERMANY

PREAMBLE

The chemical industry is a key sector for sustainable development. As an innovation driver for business and society, the industry plays its part in helping a growing world population to achieve a better quality of life.

The chemical industry in Germany – from pharmaceutical enterprises to plastics processing firms – has embraced sustainability, understanding it both as an obligation to present and future generations and as a strategy in which economic success is coupled with social equity and environmental responsibility.

The products made by the chemical industry contribute towards a sustainable future, both directly and as the basis for innovations in other industries. With its economic strength and its large number of small and medium-sized enterprises, the German chemical industry is well set up to thrive in the future – in its home market of Germany, in Europe, and around the world. Its conduct is rooted in the fundamental principles of protecting people and the environment and striving for good and fair working conditions. This commitment on the part of the chemical industry in Germany is demonstrated by its participation in the Responsible Care initiative and in its social partnership activities.

The sustainability initiative “Chemie³” (Chemistry³) takes this engagement further. The sense of commitment shared by companies, employees, social partners and trade association highlights the fact that sustainability requires an all-encompassing approach which unites economic, environmental and social aspects.

The aim of these guidelines is to underpin sustainability as a guiding principle of the chemical industry in Germany and to provide inspiration for the international community. As a sector-specific umbrella, the guidelines provide orientation for enterprises and their workforces. They reflect core elements from national, European and international initiatives and standards, such as the 10 principles of the UN Global Compact, the Core Labour Standards of the International Labour Organisation (ILO), and the OECD Guidelines for Multinational Enterprises. They are the result of a dialogue with stakeholders within the industry as well as the political, social, scientific and economic realm.

In our Chemie³ initiative, we are pooling the capabilities, experience and knowledge of a strong alliance comprising VCI, IG BCE and BAVC. Our ambition is to enable people around the globe to utilise the potential that chemistry offers for sustainable development.



Dr. Karl-Ludwig Kley
President of VCI



Michael Vassiliadis
Chairman of IG BCE



Margret Suckale
President of BAVC

GLOSSAR

The German chemical industry

As the third-largest sector, the chemical industry is a major pillar of Germany's industrial base. It plays a key role in many value chains as a supplier to other industries, but we also use its products directly in our daily lives. The chemical industry includes the following sub-sectors: organic and inorganic base materials; fine and specialty chemicals, such as paints and coatings or plant protection products; plastics and the manufacturing of plastic goods; pharmaceuticals and active pharmaceutical ingredients; and consumer products such as adhesives, household detergents and cleaners, and cosmetics.

ILO Core Labour Standards

The Core Labour Standards are a set of eight international conventions defining fundamental labour rights and social standards. They were enshrined in a declaration issued by the International Labour Organisation (ILO) in 1998. The standards include: freedom from child labour and forced labour, freedom from discrimination at work, freedom of association and the right to collective bargaining.

OECD Guidelines for Multinational Enterprises

The OECD Guidelines for Multinational Enterprises are internationally recognised as standards promoting responsible governance. The 34 member states of the Organisation for Economic Co-Operation and Development (OECD) and eight additional states have signed the guidelines and committed themselves to urge all multinational companies operating within their territories to comply with the guidelines along their value chains. The guidelines are not legally binding.

Responsible Care

Responsible Care is a global initiative of the chemical industry. It stands for the commitment to act responsibly, beyond legal requirements, and includes product stewardship, driving sustainability forward, ensuring even higher levels of safety for factories and local communities, improving workplace health and safety, and striving for better environmental protection.

Social partnership

The term social partnership describes the continuous joint efforts of employers and employees to seek the best solutions for company and employees alike. This dialogue is conducted on an equal footing and serves to balance any conflicts of interest while identifying and promoting common interests. A lively and productive exchange between social partners requires a 'can do' attitude, courage and mutual trust. Social partnership provides the sector with a code of practice and needs to translate into meaningful and tangible benefits in the sectors' day-to-day life. Social partnership in the German chemical industry is evident above all in the modern sectoral collective agreements, non-collective-bargaining agreements with social partners, joint institutions of the social partners, and active participation in the social dialogue in European and international dialogue.

United Nations Global Compact (UNGC)

The United Nations Global Compact is a strategic initiative for business enterprises which commit to align their operations and strategies to ten universally acknowledged principles covering human rights, labour standards, environmental protection, and the fight against corruption. In this way, the business community as a major driver of globalisation can help to ensure that the development of markets and trade relationships, new technologies as well as finance can benefit all economic areas and all societies.

OUR GUIDELINES

1 INTEGRATING SUSTAINABILITY INTO THE CORPORATE STRATEGY

Enterprises in the chemical industry make sustainability an integral part of their corporate strategy. Sustainability is relevant to all areas of business. The setting of individual targets prompts each company to adapt to the principles of sustainable development gradually and consistently. The employees are actively involved in this process. Ideas and suggestions put forward by members of the general public, politicians, the business community and academia are noted and evaluated.

Enterprises anchor all three dimensions of sustainability in their strategies – economy, environment, and society:

- Long-term economic targets, global competitiveness and sound financial health of the enterprises are the basis for jobs, innovations and investments. Enduring business success benefits the employees, the owners or shareholders, and the economy.
- The protection of people and the environment and the responsible use of resources are firmly anchored in the companies and are supported and continuously further developed through the implementation of programmes such as Responsible Care.
- The enterprises see themselves as part of society and stand for active social responsibility. In Germany, this translates into commitment to the country's social market economy ("Soziale Marktwirtschaft") and their engagement in the unique social partnership within the chemical industry.

Chemical industry enterprises respect and uphold human rights world-wide. Compliance with laws and regulations is a basic obligation for all companies and a prerequisite for sustainable business.

2 ACHIEVING SUSTAINABLE INVESTMENTS AND VALUE CREATION

The companies in the chemical industry design their business policies for long-term value creation. Maintaining and improving global competitiveness and securing jobs are of paramount importance. The companies actively work to create sound business structures and establish internal incentive systems designed to promote long-term success. When investing, they combine efficiency with safety, environmental protection, optimised energy and resource use with social responsibility, while applying comparable standards all over the world.

3 PROMOTING ECONOMIC STABILITY AND GLOBAL COOPERATION

Through their economic success, enterprises in the chemical industry create regional and global development opportunities and thus contribute to the economic stability in the local areas where they operate. They show their commitment on a national and international level as partners for sustainable development and as responsible role models. They work to ensure that high environmental and social standards are applied in their value chains around the world.

4 DRIVING SUSTAINABILITY THROUGH INNOVATION

Enterprises in the chemical industry develop innovative solutions to meet global and national challenges. Through significant investments in research and development they create added value for business and society. When developing new products and processes, they consider sustainability issues at an early stage.

5 IMPLEMENTING SUSTAINABILITY IN OPERATIONAL PROCESSES

Enterprises in the chemical industry establish their own individual procedures and structures to ensure clear allocation of responsibilities for implementing their sustainability measures and continuously improving their processes and products. They integrate measures in their corporate processes to abolish child and forced labour as well as to fight corruption.

6 SECURING DECENT WORK AND AN ACTIVE SOCIAL PARTNERSHIP

Enterprises and employees in the chemical industry believe in collaborating as social partners and in decent working conditions as a prerequisite for sustainable development. They see the unique chemical industry social partnership as the best way to balance the interests of employers and employees to their mutual benefit. This is also achieved by applying these principles and collaborating as partners on the enterprise level. Through collective agreements and commitment to such agreements, social partner agreements, co-determination and other forms of collaboration, employers' associations, trade unions, corporate management and works councils establish an atmosphere of security, participation and transparency, while ensuring decent and competitive working conditions in Germany. The enterprises

actively include their employees and encourage them to become involved and assume responsibility. They shape sustainable development in a spirit of partnership and endeavour to promote good social standards nationally as well as internationally.

7 MANAGING DEMOGRAPHIC CHANGE AND SECURING SKILLS

Enterprises and employees in the chemical industry see managing demographic change as a shared responsibility. Social partners, management and works councils are further developing their collective agreements and socio-political activities in this area. Enterprises and their employees are committed to promoting professional and vocational training, life-long learning, and assuring the availability of skilled employees as well as establishing work arrangements that are compatible with different phases in life and are family-friendly. Employers and employees rely on a good education, a high skill level, and reaching the full potential offered by diversity in the workforce.

8 PROTECTING PEOPLE, THE ENVIRONMENT AND BIODIVERSITY

Enterprises and employees in the chemical industry are committed to protecting people, the environment and biodiversity around the world. In a continuous improvement process, they take into consideration not only their own processes but the entire life cycle of their products. They place a high priority on product and plant safety as well as continuous process optimisation and act according to the principles of the Responsible Care initiative. By assessing risks at an early stage, the companies help to ensure that potential safety risks relating to their products and processes will be detected and can be avoided. Companies seek ways to strike a balance between economic, environmental and social impacts when using biological diversity for purposes of biotechnological and pharmaceutical innovation.

9 PROMOTING RESOURCE EFFICIENCY AND CLIMATE PROTECTION

With highly energy-efficient production facilities, resource-friendly processes and innovative products for their customers, enterprises in the chemical industry make a significant and indispensable contribution to global climate protection. They continuously improve efficiency with regard to feedstocks and energy use, for economic as well as environmental reasons. In doing so, they consider the overall product life cycle. The

businesses utilise renewable and recyclable raw materials wherever it is technically feasible and economically, environmentally and socially useful or desirable to do so. Respect for natural habitats when sourcing raw materials is of major importance.

10 ENGAGING WITH COMMUNITIES AS GOOD CITIZENS

As good citizens, enterprises and their employees promote sustainable development in the local communities where they do business at national and international level. They are active partners to the regional actors, engaging in activities and encouraging volunteering so that people in their region can live well. In particular, they help to create educational and other opportunities to empower young people.

11 CREATING TRANSPARENCY AND SHOWING INTEGRITY

Enterprises in the chemical industry ensure that their efforts to promote sustainability are communicated in a transparent and understandable way to employees, customers, and the general public. When doing so, they use recognised standards and indicators as an orientation. Companies and their employees behave with openness, credibility and integrity in their dealings with policy-makers and the general public.

12 FOSTERING A DIALOGUE AND ENHANCING PARTICIPATION

Enterprises of the chemical industry seek a dialogue with their stakeholders in politics, society, academia and the business community in order to include their knowledge, values and interests in their business decision processes. In addition, they encourage involvement and participation of their employees in the decision-making process and maintain a dialogue with the communities they operate in.

