



The chemical industry in Europe:

# Towards Sustainability

2011/12 Report





**Responsible Care®** embodies the chemical industry's commitment to:

- Continuously improve the environmental, health and safety knowledge and performance of our technologies, processes and products over their life cycles so as to avoid harm to people and the environment.
- Use resources efficiently and minimize waste.
- Report openly on performance, achievements and shortcomings.
- Listen, engage and work with stakeholders to understand and address their concerns and expectations.
- Cooperate with governments and organisations in the development and implementation of effective regulations and standards, and to meet or go beyond them.
- Provide help and advice to foster the responsible management of chemicals by all those who manage and use them along the product chain.



## Contents

<b>1</b>	<b>The way forward</b>		3
<b>2</b>	<b>The Cefic vision</b> Bringing the vision to life		5
<b>3</b>	<b>The three pillars</b> Key Performance Indicators		7
		<b>Planet</b>	9
		<b>People</b>	27
		<b>Profit</b>	37
<b>4</b>	<b>Leveraging legislation and voluntary efforts</b>		49
<b>5</b>	<b>Industry's products: contributing solutions</b>		53
<b>6</b>	<b>The future: challenges &amp; opportunities</b>		61
<b>7</b>	<b>Methodology</b>		67
	<b>Acknowledgements</b>		70



“Sustainable development... can be our unifying ambition. Europe, with its industry, can lead towards more growth using fewer resources, showing that ‘doing more with less’ is possible. We have no alternative, if by 2050 we want to meet the needs of 9 to 10 billion people living well on this planet... we know that our stakeholders expect our industry to play an important role in finding appropriate solutions to the manifold challenges.”

GIORGIO SQUINZI,  
Cefic President, opens Cefic General  
Assembly in Madrid, September 2011

## THE WAY FORWARD

This is the first sustainability report published by Cefic, and we hope it will improve understanding of chemistry’s role in society – and more specifically the role of the chemical industry in Europe.

This report is also a first step in strengthening our dialogue with key stakeholders: in finding out what their expectations are, and responding to those expectations, as well as enhancing public awareness of the positive contributions made by our industry as part of the drive towards global sustainability.

Sustainable development means achieving a balance that enables each of its three pillars – people, planet and profit – to thrive. For the chemical industry, there’s another “p” which is fundamental to its existence: products. So throughout this report, we also offer examples of innovative products and initiatives, and ground-breaking advances that help make the sector an essential part of the future.

Industry’s products and services play a crucial role in addressing the challenges the world faces today, and in helping provide solutions to those that lie ahead. Partnerships and collaboration within industry are essential; so, too, are partnerships with authorities, with those throughout the value chain, and with academic and research institutions, as well as civil society.

Both Cefic’s own surveys and external research have shown that public opinion of the chemical industry differs from one country to another.

We continue to address challenges in the arenas of environment, health and safety, chemicals management, and communication with our stakeholders, particularly with regard to product impacts. We have made major improvements over the past few decades and will continue to strive for further advances, while raising public awareness of the benefits we bring to society – which is a challenge in itself.

This report is core to our efforts to communicate industry’s contribution to sustainable development and brings together a collection of statistics and case studies from companies and sector groups. It highlights examples of leading-edge practices and products that we hope will inspire others in the business of chemistry and demonstrate to our stakeholders that we are playing an important role in driving the sustainability agenda.

Under Europe’s robust legislative framework with REACH as a centerpiece – incorporating comprehensive systems for risk assessment and management – and fully supported by industry’s voluntary Responsible Care initiative with its commitment to sustainability, Cefic and its members are ready to focus their efforts on being a key enabler of a sustainable society. While we are in no doubt that it will be a demanding journey with plenty of challenges, we also believe that it is the right way forward.



**Carl Van Camp,**  
Chairman, Sustainability  
Strategy Group



**Giorgio Squinzi,**  
President of Cefic

“I would like to commend Cefic for publishing their first sustainability report and outlining such a clear and bold vision for the future. As a key contributor to sustainable development, the chemical industry needs to continue to participate in the societal debate on how to transform the sector in “meeting the needs of over 9 billion people in 2050,” as outlined in this report. This will undoubtedly require more innovations, more investments and more partnerships. A tall order, but one the European chemical industry can live up to.”

BJÖRN STIGSON, President (1995-end 2011),  
World Business Council for Sustainable  
Development (WBCSD)



## THE CEFIC VISION

**The European chemical industry is determined to play a key role in ensuring that by 2050 over 9 billion people live well, within the resources of the planet.**

- It will gear all of its activities towards enabling a future where people have access to the necessities of a healthy life, to economic prosperity and to societal progress.
- It will drive a quantum leap in innovation enabled by investments and partnerships.
- It will join forces with all its stakeholders, including governments and civil society.
- It will strive to be sustainable in terms of its operations and a key enabler of a sustainable society through the excellence of its employees and the benefits of its products.
- It will keep attracting investments by way of its strong economic performance.

## BRINGING THE VISION TO LIFE

The vision outlined by Cefic is aspirational, yet this industry is also fundamental to bringing the vision to life. It is, perhaps, better placed than any other sector to tackle the challenges of sustainability, given industry's proven track record in innovation, its deep integration in the supply and value chains and its ubiquitous presence throughout Europe. In fact there's virtually no product, no service or human activity that does not in some way rely on the contribution of chemistry.

While working towards this vision, our industry is well aware of its continued responsibility to manage chemicals safely throughout their entire life cycle, and to translate emerging scientific insights into action in order to meet the highest standards of public and individual health and safety. We remain committed as ever to programmes such as Responsible Care – which was developed with global partner industries to help us meet or exceed regulation, and to achieve continuous improvement in our health, safety and environmental performance. Equally, we are committed to the risk management approach promoted under the International Council of Chemical Associations' Global Product Strategy<sup>1</sup> (see page 49).

<sup>1</sup>. [www.icca-chem.org/](http://www.icca-chem.org/)

## What is sustainable chemistry?

The OECD defines sustainable chemistry as: “the design, manufacture and use of efficient, effective, safe and more environmentally benign chemical products and processes. Within the broad framework of sustainable development, government, academia and industry should strive to maximise resource efficiency through activities such as energy and non-renewable resource conservation, risk minimisation, pollution prevention, minimisation of waste at all stages of a product life-cycle, and the development of products that are durable and can be re-used and recycled.”

These programmes provide a blueprint for industry’s implementation of the UN-led Strategic Approach to International Chemicals Management (SAICM) and meeting the 2020 goals for safer chemicals management.

The Cefic Vision also commits the chemical industry in Europe to its important partnership role in making the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) work, in the belief that it can benefit society and serve to strengthen Europe’s position on the global stage. REACH can not only improve chemicals management but has also strengthened product knowledge and enhanced communications throughout the value chain.

Industry’s ability to attract and retain a skilled workforce is an essential element in achieving the Cefic Vision. Cefic and its members’ employees drive partnerships such as SusChem and the Long-range Research Initiative which have provided a solid platform for future endeavours, such as developing industry’s role in the Commission’s European Innovation Partnerships.

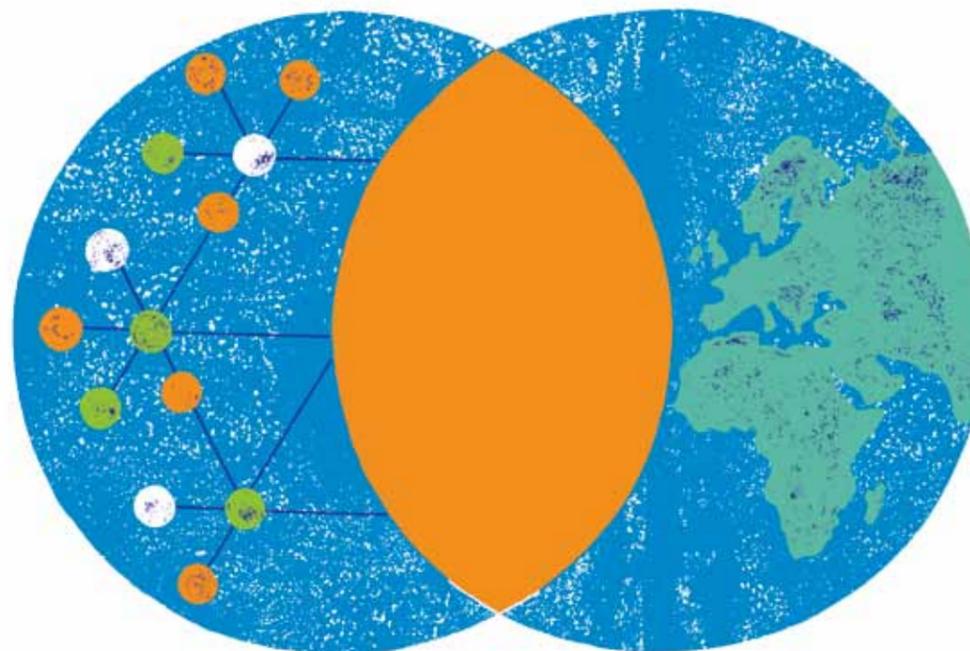
In the following pages we review our performance against standard Key Performance Indicators (KPIs), and offer some of industry’s best examples of how the products of chemistry are meeting the needs of society and contributing to sustainable development.

This report has come about through the recognition that we have not only the capability but also the responsibility to address societal challenges of sustainability such as energy, water, raw materials or, more broadly, resource efficiency. We are already implementing actions across the supply chain and intend to show how partnerships in both the private and public sectors can unleash capabilities that individual players cannot provide. We sincerely hope that these examples stimulate a genuine dialogue and real action on what might be achieved if we leverage our joint strengths in industry, academia and government and work towards the common objective of a sustainable future for Europe.



**PLANET**  
**PEOPLE**  
**PROFIT**

**This section is based around the Key Performance Indicators (KPIs) that help illustrate the European chemical industry’s commitment and contributions to sustainable development. They fall under the three traditional pillars of economic development, social development and environmental protection, and are reinforced with examples of the chemical industry’s products and initiatives.**



We selected those KPIs supported by EU statistics and most appropriate for use by an association. They have been compiled from data supplied by Eurostat and the European Pollutant Release and Transfer Register, E-PRTR. We have also drawn on internal supplementary figures provided by national chemical associations which collect performance data as part of the global Responsible Care initiative. Readers should be aware that the statistics provided under the two reporting processes are not comparable: Responsible Care data covers only those chemical companies that are members of their national chemical association and actively participate in the initiative; as well, not every association participates fully in voluntary reporting.

The KPIs demonstrate how the European chemical industry is performing over time, and are also an important tool to help us identify opportunities for improvement. The ‘Planet’ indicators relate to the environment; the ‘People’ KPIs reflect social performance; while the third tranche, ‘Profit’, addresses economic performance and the role of Europe’s chemical industry within the economy as a whole.

See Methodology page 67 for further details.

“I welcome Cefic’s vision statement. Resource efficiency is not only about protecting the environment and preserving our natural resources, it is also about competitiveness and growth. Our natural resources are in a fragile state and as world population continues to grow, we have no choice but to use the limited resources available more efficiently and learn to do more with less. The chemical industry is a major user of precious natural resources, such as water and energy, and can play a key role in enabling others [to] deliver on resource efficiency. It will be those companies that adapt their processes and their products to the megatrend of resource constraints that will be the most competitive.”

JANEZ POTOČNIK,  
European Commissioner  
for the Environment



# THE ENVIRONMENTAL PILLAR

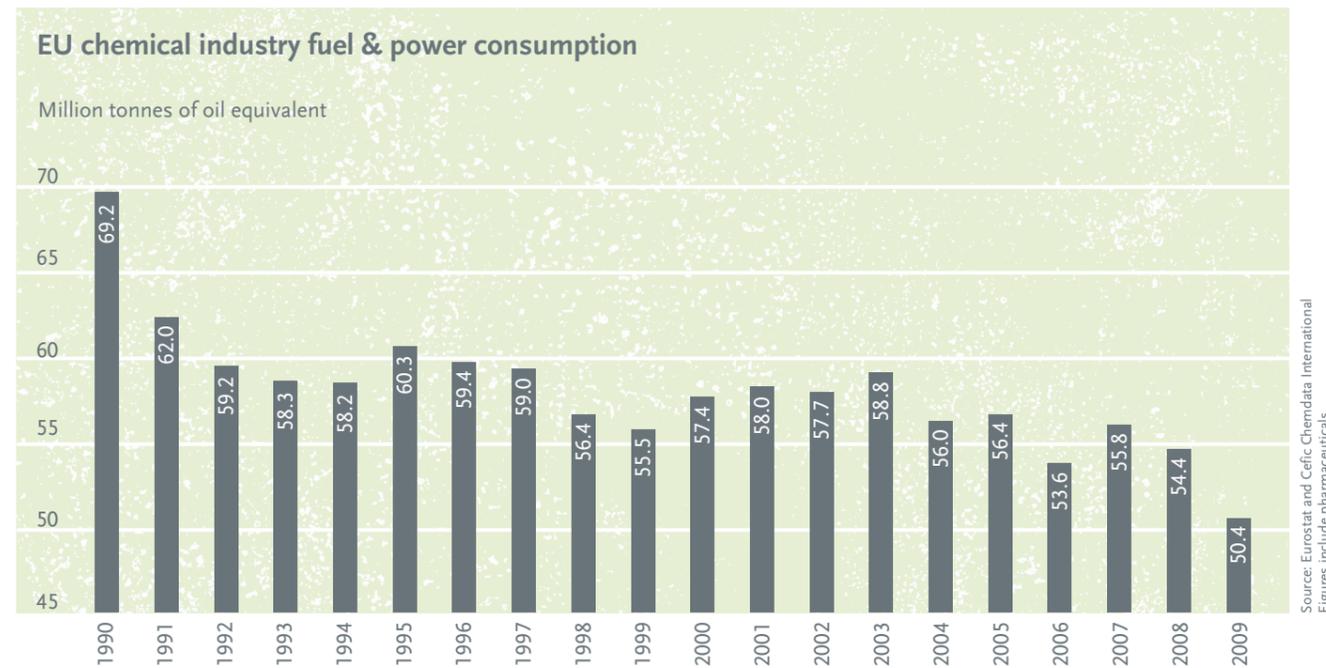
## THE ENVIRONMENTAL PILLAR

Environmental awareness of industry, governments and indeed all stakeholders is higher than it has ever been. Major reductions in emissions have been achieved through a combination of optimising the production process, and continued implementation of Best Available Techniques. As an industry sector, we have also made great strides in improving environmental performance through implementation of our global voluntary initiative, Responsible Care. While further improvements become harder to achieve, our efforts will continue. We are investing more in processes and products with a reduced environmental burden using essential tools such as risk assessment, risk management and life cycle assessment, to supply goods and services that play an important, growing role in protecting the planet for future generations.

### Key Performance Indicators

Taking less to make more	10
A more efficient way forward	12
Lowering greenhouse gas emissions	14
Clear to see: Europe’s healthier, cleaner air	17
Stewardship efforts bear fruit	18
Exploring ways to reduce waste	19
Managing the water issue	21
An essential balance	23
Working towards a sustainable supply chain	24

## TAKING LESS TO MAKE MORE



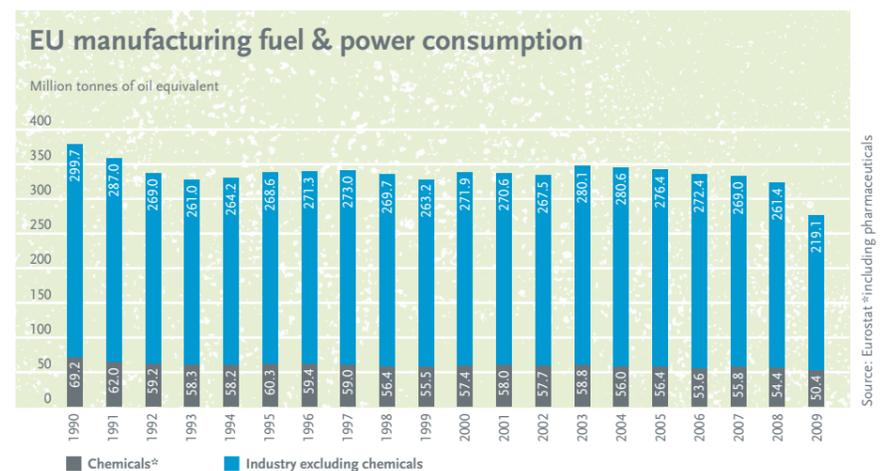
Source: Eurostat and Cefic Chemdata International  
Figures include pharmaceuticals

### Contribution to EU 2020 targets

Today more than ever before, energy efficiency is a key part of industry strategy. Consumption has fallen nearly 27% to 50.4 million tonnes of oil equivalent (TOE) from 1990 to 2009 while chemicals output has increased. While acknowledging the clear influence of the economic crisis on 2009 consumption levels, the reduction over the long-term is a clear trend.

Making industry's production more resource efficient is not only good for the planet but also reduces costs and improves profitability. Those efforts are reinforced through the European Commission's economic strategy, set out under the EU 2020 targets.

Our industry's achievements – including a degree of progress in decoupling resource use and production growth – already contribute to the EU target of a 20% increase in energy efficiency by 2020.



Source: Eurostat \*including pharmaceuticals

# CARE+

“Thanks to the CARE+ Energy Efficiency Self Audit, we found energy savings in our administrative building which will reduce heat consumption by around 27%. This will help us to improve the profitability and energy efficiency of our business.”

RAFAL MUSKUS,  
Member of the Board  
Silikony Polskie Ltd, Poland

Achieving further energy efficiency gains is a real challenge requiring careful consideration and a meaningful dialogue between policymakers, academia and industry. But meeting that challenge will make Europe a more attractive, efficient manufacturing hub and will act as a motor for EU growth and employment.

Our industry uses natural sources as fuel and, to a larger extent, as feedstock to produce essential goods for society. Chemicals have input into virtually every sector, enabling solutions that improve resource efficiency throughout the life cycle of finished goods.

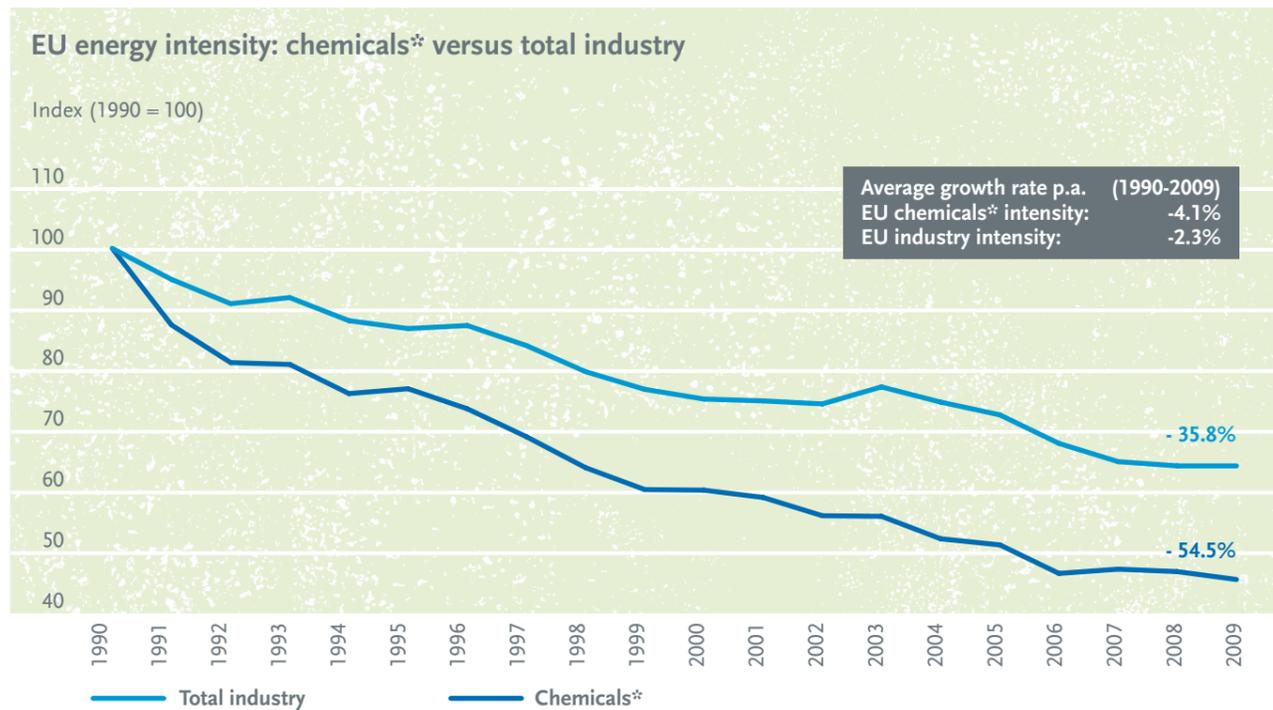
## Partners in Care+

Backed by the European Commission under its ‘Intelligent Energy Europe’ programme, and implemented through industry’s own Responsible Care ethic by national associations in Italy, Poland and Bulgaria, Cefic’s Care+ programme targets the 96% of chemical companies in Europe that are defined as SMEs (those with less than 250 employees). More recently, chemical associations in Finland, Belgium and the Netherlands have also agreed to integrate Care+ in their national approaches, and others are expected to follow suit.

An Energy Efficiency Self Audit Guide and a best practices manual are two easy-to-use tools at the heart of the Care+ programme. The auditing process takes a company through an analysis of its energy performance, helping to determine areas of strength and where improvements can be made. Best practices focus on energy management and measuring consumption as well as specific issues which have the most potential for savings. Care+ confirms that energy savings of 15% and more are achievable across the sector.



## A MORE EFFICIENT WAY FORWARD



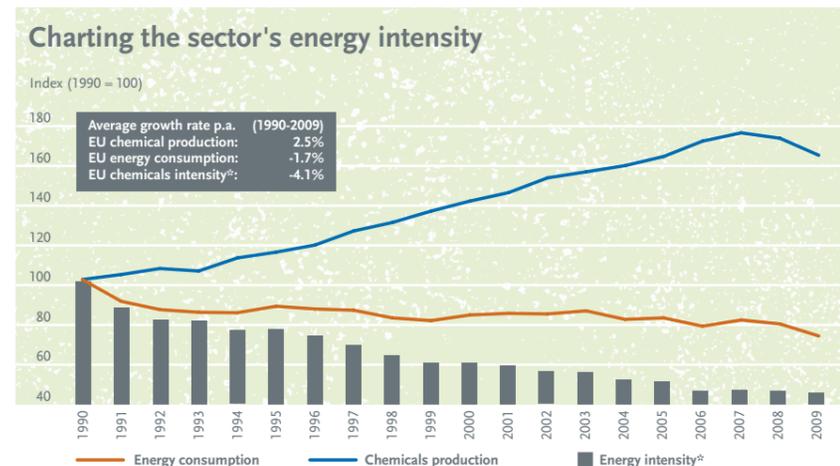
### Striving to remain competitive

Between 1990 and 2009, annual production climbed an average 2.5% while energy consumption fell 1.7%. Europe's producers are focused on reducing fuel and power consumption per unit of production to ensure they remain competitive on world markets. State-of-the-art plants and processes, new technologies, and skilled operators are all essential elements in achieving that competitiveness. Industry's innovation is crucial as energy efficiency is subject to decreasing returns: the higher the level of energy efficiency attained, the harder it is to make further improvements.

### An integrated chemicals sector

Increasingly, chemical companies look at the whole value chain, from raw materials to end use, seeking better integration of activities, improvements

and solutions based on cooperation. As well, sector groups are developing initiatives they can leverage to promote energy efficiency through the value chain including logistics, or through outreach campaigns related to product use on the part of the consumer.



“To achieve a resource-efficient Europe, we need technological improvements, transition in energy, industrial, agricultural and transport systems, and changes in behaviour as producers and consumers. A vision of where Europe should be in 2050 and a long-term policy framework can provide a clear path for businesses and investors.”

European Commission statement, 2011 COM (2011) 21 Final

## Sustainable cleaning

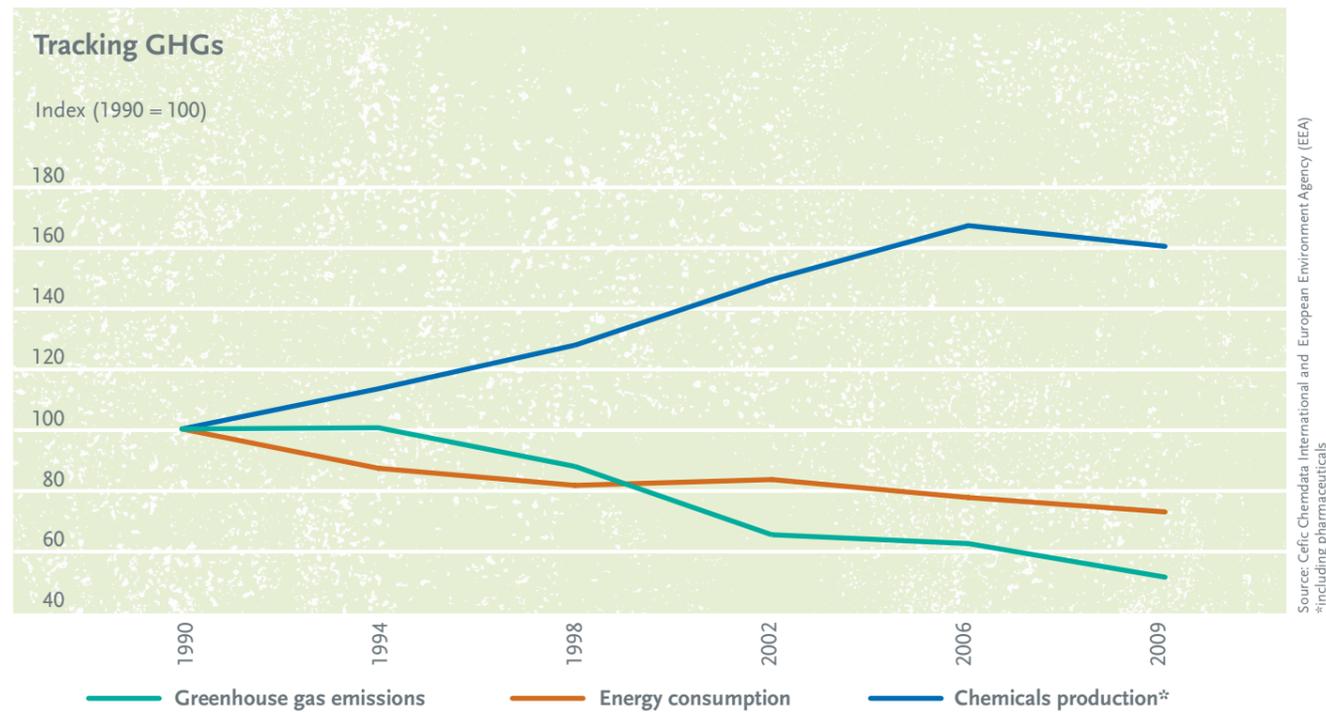
Among a number of voluntary initiatives undertaken by A.I.S.E., the International Association for Soaps, Detergents and Maintenance Products, are its Laundry Sustainability Projects (LSPs). Since 2006, these have encouraged the reduction of chemicals, packaging and energy used in product manufacturing, delivery and use in the household laundry detergent sector.

LSPs are backed by communication activities designed to encourage consumers to wash in a more sustainable way – at lower temperatures, without loss of cleaning power, for example – and to dose according to the instructions. Ongoing innovation in laundry compaction has resulted in more concentrated formulations for both powder and liquid detergents. That means using less water during manufacture, fewer emissions, less packaging, and a reduction in the impact of shipping. More recently, this has been taken to a new level with the development and launch of single dose units which have an even smaller carbon footprint.

As of February 2012 more than 160 companies representing more than 85% of the total production output for Europe have joined A.I.S.E.'s Charter for Sustainable Cleaning project, adopted in 2005 and updated in 2010. The Charter is a life cycle-based framework for promoting a common industry approach to improving sustainability and reporting.

To encourage the more sustainable use of products by consumers, Cefic and A.I.S.E. have developed a joint website [www.cleanright.eu](http://www.cleanright.eu).

## LOWERING GREENHOUSE GAS EMISSIONS



### Halving emissions since 1990

Chemical industry emissions of greenhouse gases (GHGs) have been falling continuously since 1994, representing a significant contribution to reductions in Europe by manufacturing as a whole, and thus to the EU 2020 reduction target of 20%. European Environment Agency (EEA) data shows the European chemicals sector emitted a total of 147.4 million tonnes of CO<sub>2</sub> equivalent in 2009, down from a total of 286.8 million tonnes in 1990, a reduction of 49%. While industry does not expect to be able to maintain similar dramatic reduction rates for the future, efforts will continue, as will the search for new, improved solutions.

### Driving down intensity

The reduction has been achieved at the same time industry recorded a 60% increase in production. Efforts have focused on developing cleaner and safer technologies, on waste recycling processes and on new products to safeguard the environment, including biotechnology processes, catalysts, membranes and desulphurisation. Further major incentive for improvement will come from implementation of Europe's Emissions Trading Scheme Directive which encourages member states to plough back a minimum 50% of revenues into research and development of technologies that emit less GHGs.

As well, progress is a result of voluntary agreements that a number of national chemical associations have with their governments. For example, the German chemical industry made a commitment in 2000 to reduce GHG emissions by 45-50% by 2012 using 1990 as a baseline, and reached this target ahead of time in 2009. Carbon capture and storage (CCS) is another area with potential to make further headway: according to the International Energy Agency (IEA), rapid development of CCS could account for 19% of the CO<sub>2</sub> reduction targeted by the EU27 by 2050. Industry and government are working together to deliver successful CCS demonstration projects at industrial scale in a number of schemes around Europe.

### How industry products save GHG emissions

Industry association PlasticsEurope commissioned the independent Denkstatt Institute in Austria to undertake an analysis to quantify the effect of energy use and GHG emissions resulting from the use of plastics in our society. Results show that GHG emissions would rise more than 60% if plastic products were to be substituted to a theoretical maximum by other materials<sup>1</sup>.

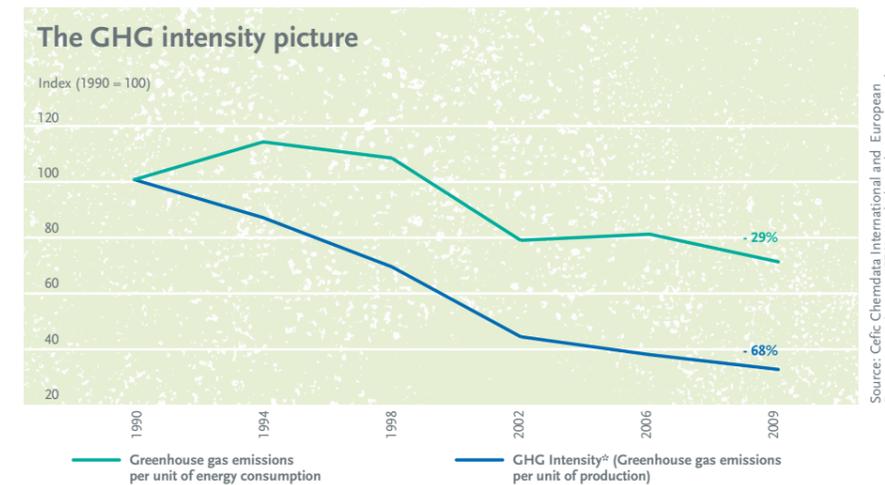
In another, broader study, Innovations for Greenhouse Gas Reductions analyses GHG emissions and savings of the chemical industry across the life cycle of chemical products. The report, issued by the global industry body the International Council of Chemical Associations (ICCA) in July 2009, was based on the findings of a project conducted with McKinsey & Co. using life cycle studies that were critically reviewed by leading European research and consultancy group Öko Institut<sup>2</sup>.

The study's most important finding is that – over their life cycle – products of the chemical industry save 2.5 times the GHG emissions that occur during the manufacturing phase.

This finding reinforces the role of our sector as an innovator and solutions provider that will help reduce GHG emissions throughout economies and society. It highlights the importance of innovation and collaboration up and down the supply chain to maximize these reductions.

Importantly, the study also concluded that the ratio of emissions saving to emissions could increase to more than 4:1 by 2030.

1. [www.plasticseurope.org](http://www.plasticseurope.org)  
2. [www.icca-chem.org/ICCADocs/ICCA\\_A4\\_LR.pdf](http://www.icca-chem.org/ICCADocs/ICCA_A4_LR.pdf)



## Data gathering

Data in the following pages covering industry's emissions of acidifying gases, non-methane volatile organic compounds (NMVOCs), releases of nitrogen and phosphorus to water, water quality, and waste treatment has been gathered under the European Pollutant Emission Register (EPER) for 2001 and 2004, and thereafter under the European Pollutant Release and Transfer Register (E-PRTR) adopted in 2006.

Readers should bear in mind the following:

- 2001 data refer to EU 15; 2004 data to EU 25; latest data to EU 27. Comparisons can be made only at EU 15 or EU 27 levels.
- 2008-2009 were years of economic crisis when demand and, therefore, production were generally lower, and some plants were closed; related emissions would be expected to decline.

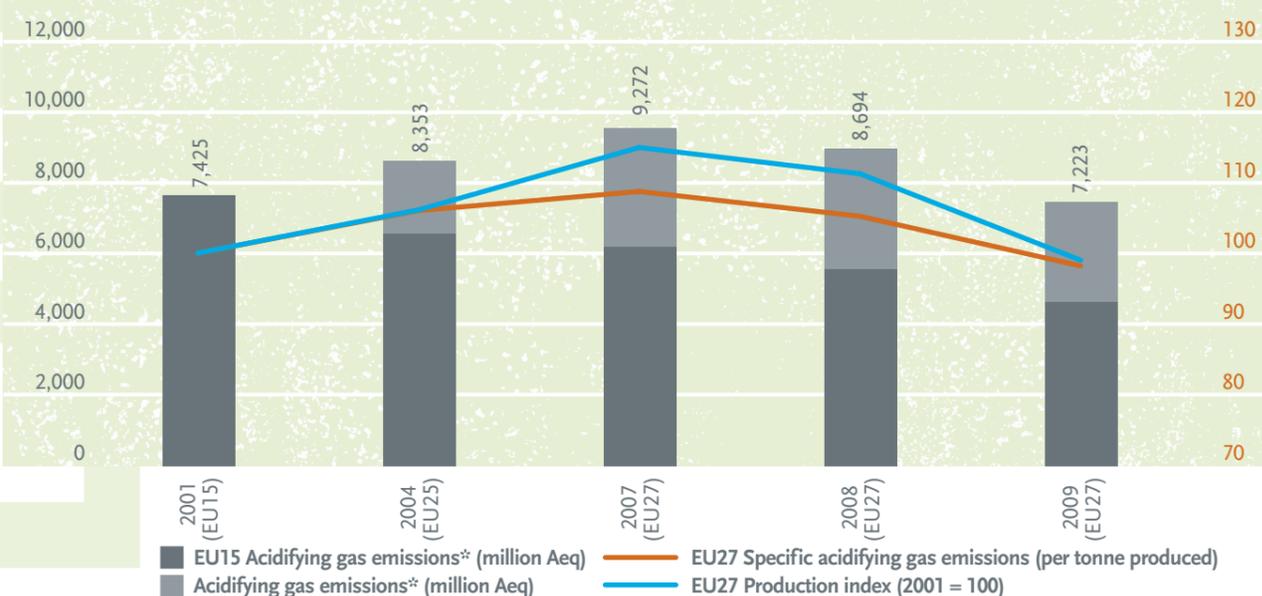
Industry's voluntary reporting efforts have been carried out through the Responsible Care initiative, and date back to the issuing of Cefic's 1993 Guidelines on environmental reporting. Reporting provides a mechanism for industry to measure and improve on its environment, health and safety performance under company and national level Responsible Care activities, as well as Europe-wide efforts. We have used Responsible Care data collated, aggregated and submitted by national chemical associations as an additional source of information.



## CLEAR TO SEE: EUROPE'S HEALTHIER, CLEANER AIR

Emission of total acidifying gases\* in the EU chemical industry

Million of acid equivalent (million Aeq)



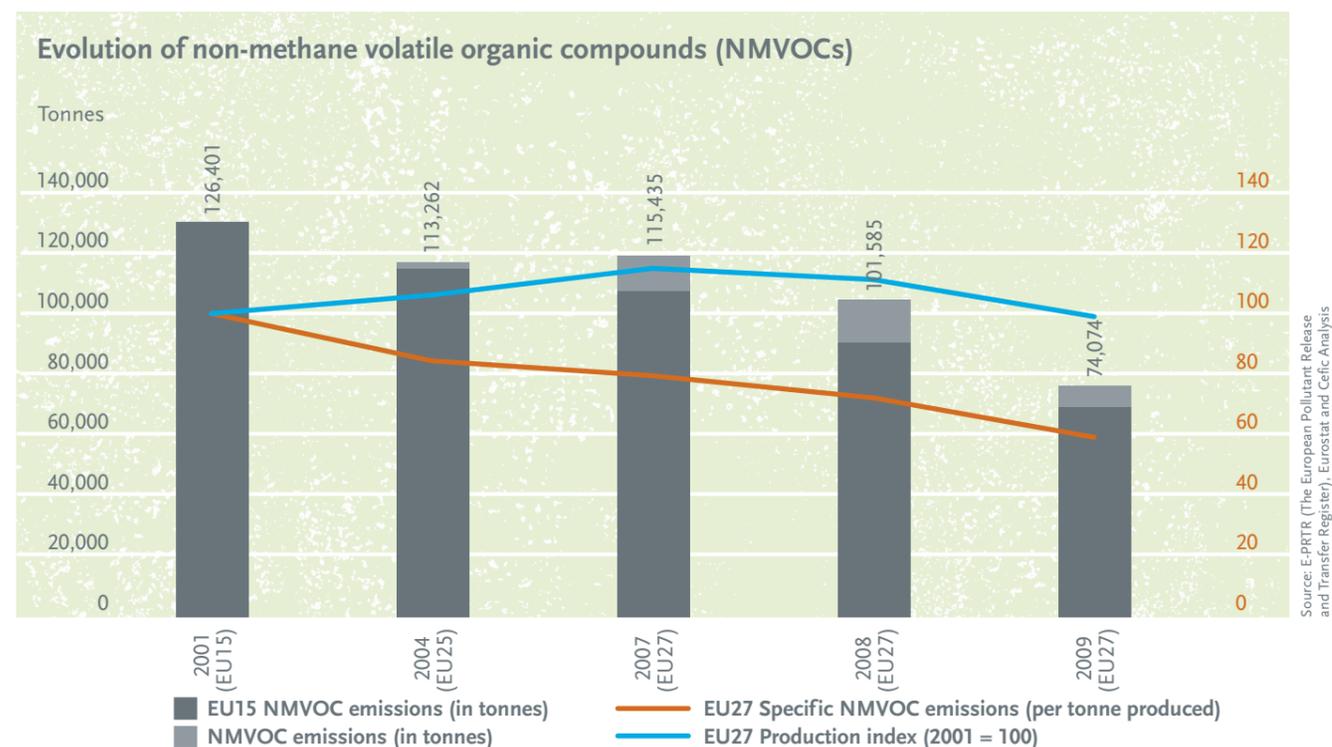
Source: E-PRTR (The European Pollutant Release and Transfer Register) and Cefic Analysis  
\*Ammonia (NH<sub>3</sub>) + Sulphur oxides (SO<sub>2</sub>/SO<sub>3</sub>) + Nitrogen oxides (NO<sub>x</sub>/NO<sub>2</sub>), and Eurostat

### Industry to build on reductions

Based on E-PRTR data together with Cefic analysis, the chart reveals that emissions of total acidifying gases, expressed in acid-equivalent, have fallen 14% over a five-year period since 2004, based on comparing the EU25 of 2004 with the EU 27 of 2009. Using only E-PRTR data, total emissions of acidifying gases in the EU chemicals industry fell 22% since 2007. While this is a significant drop, the short timeframe means it is not possible to draw any real conclusions on the success or otherwise of industry efforts to reduce emissions of these pollutants.

The E-PRTR database on total emissions of acidifying gases covers ammonia, sulphur oxides, and nitrogen oxides. Analysis shows that ammonia registered the sharpest reduction in 2009 compared to 2007, followed by sulphur oxides and nitrogen oxides. Over the longer term, figures back to 1990 show huge decreases for pollutants reported under the Convention on Long-Range Transboundary Air Pollution (CLRTAP), and covering all manufacturing, agriculture, burning of fossil fuels, transport etc.

## STEWARDSHIP EFFORTS BEAR FRUIT



### Downward trends for NMVOC emissions

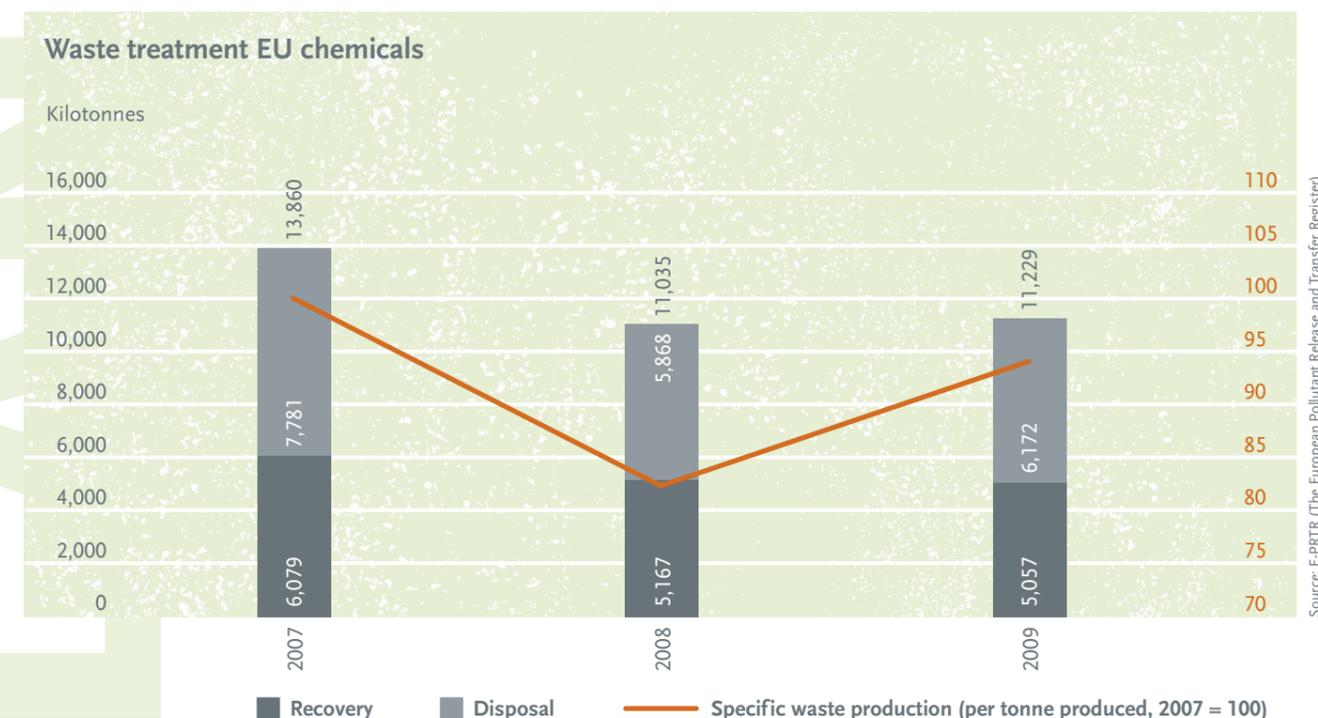
The majority of chemical industry non-methane volatile organic compound (NMVOC) emissions are fugitive emissions or occur during storage, and both sources are difficult to measure and quantify. Total emissions of NMVOCs fell 35% from 2004 to 2009 based on official European statistics with additional Cefic analysis.

The E-PRTR timeframe shows a 36% fall of chemical sector NMVOCs in some 200 industrial facilities since 2007. Even taking into account the falling production index, the data points to an actual improvement over the two-year period. We however acknowledge that there may be a degree of uncertainty to the data. The data does not cover VOC emissions during solvent use.

### Solvent sector groups support downstream users

As well as improvements in industrial facilities, Cefic sector groups run tailor-made sustainability programmes for their value chain. For example, the European Solvent Industry Group, ESIG, has a proactive approach to working with downstream users and customers; as part of its product stewardship commitment under Responsible Care, the solvents industry spends around €20 million/year on research and development to enhance product performance and increase safety and environmental protection. Producers also help individual customers recover and reuse solvents where it makes economic and environmental sense to do so.

## EXPLORING WAYS TO REDUCE WASTE



### Waste: a resource in the wrong place

Every year, according to the European Commission in its 'Roadmap to a Resource Efficient Europe', we throw away 2.7 billion tonnes of waste in the EU; 98 million tonnes of this is hazardous. On average 40% of our solid waste is re-used or recycled, the rest going to landfill or incineration. According to 2008 data, the chemical industry accounted for less than 2% of total waste materials in the EU. While overall waste generation is stable, the EC's Roadmap notes that it is on the increase for certain streams like construction and demolition, sewage sludge and marine litter. The waste generated by disposing of electrical and electronic equipment alone is expected to increase by around 11% between 2008 and 2014.

Many Cefic member companies are already implementing or developing technologies and processes that use fewer raw materials, and reuse or recycle products in a closed loop system. Down-gauging – reducing the amount of material in a product with no loss of performance – is helping industry reduce waste as well as optimise resources. Just a couple of grams saved in the weight of packaging, for example, can have a significant impact on the environment when multiplied millions of times.

Partnerships are increasingly evident throughout the industry, and beyond it, where one company's waste becomes another's feedstock.

Combined heat and power (CHP) units, as well as waste reduction where producers make every molecule count through operational excellence, also demonstrate how industry's expertise enables progress on the road to sustainability.

### Targeting zero plastics to landfill

Thanks to continuous improvement in end-of-life management options and growing public awareness, the amount of industry's products – mainly plastics – ending up in landfills is constantly decreasing, despite an increase on the previous year of 2.5% in post-consumer plastic waste to 24.7 million tonnes in 2010.

## Innovating and partnering at company level

Recycling technologies have come a long way in recent years. Suppliers of catalysts using small amounts of precious metals are operating closed loop circuits for customers to ensure these scarce materials are kept in circulation. Similarly, leading players in niche markets have developed recycling processes for products containing rare earth elements such as low-energy lights and magnets used in electric vehicles or other specialist applications. These activities are not restricted to the industry's giant multinationals: a profitable SME in Finland, launched five years ago, has developed a unique technology for recycling batteries and accumulators. The company processes materials into valuable metals suitable as raw material for other industries and for reuse. Its recycling process does not generate any CO<sub>2</sub> emissions or waste – technology innovation with a positive environmental, social and business impact.

Across Europe, our member companies are making a business out of waste, applying the maxim that 'waste is a resource in the wrong place', and identifying how one business or community can use another's waste stream by exploiting a symbiosis and contributing to sustainability. Examples include the excess heat and CO<sub>2</sub> from fertilizer manufacture being pumped to local greenhouses owned by farmers. Or the glucose-containing effluent generated by a sweet producer being used by a nearby chemical complex to maintain the necessary bacteria levels in its biotreatment plant.

Of these, 10.4 million tonnes were disposed of and 14.3 million tonnes were recovered. Overall 9.3% more post-consumer plastics were recycled and used for energy recovery in 2010 compared to the previous year. PlasticsEurope's focus on waste reduction remains a top priority with an ambitious target of zero plastics to landfill by 2020.

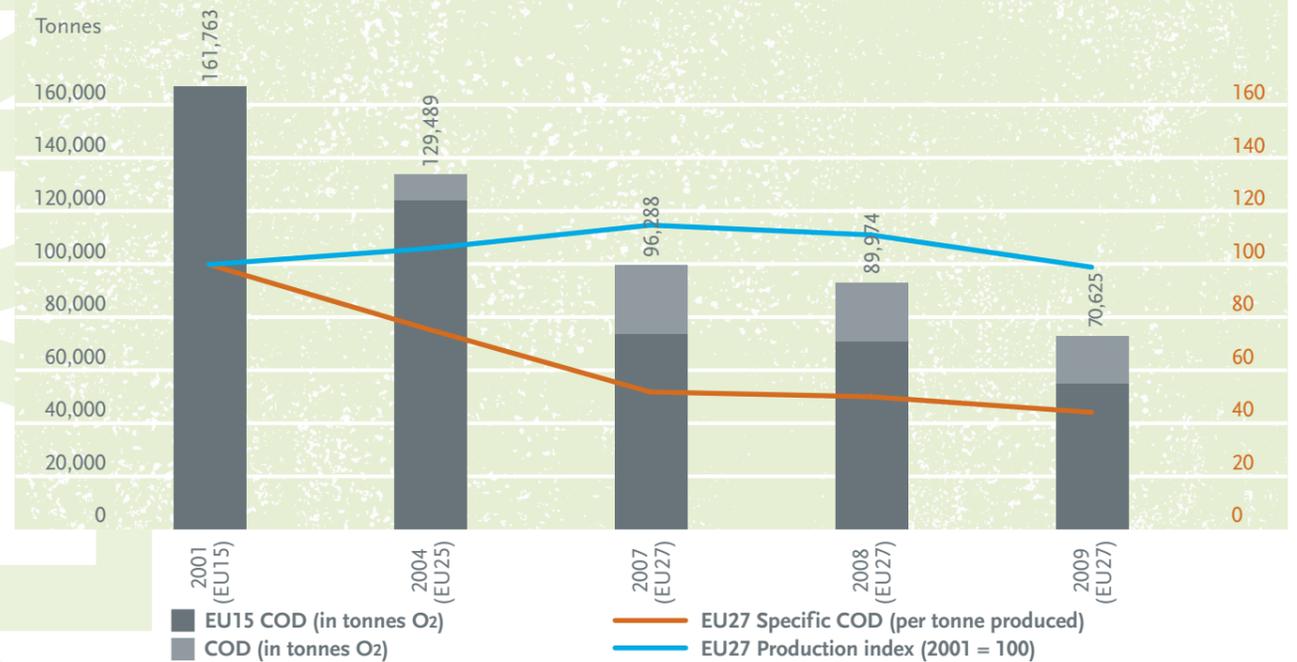
### Global initiative to tackle marine litter

Marine litter is a major environmental issue, and is being addressed by the global plastics industry in partnership with key stakeholders including environmental groups and governments.

Among the initiatives being undertaken to prevent plastics from reaching the marine environment are: promoting the diversion of plastics from landfill; addressing pellet losses from production and transport; and raising awareness through campaigns such as the International Coastal Cleanup, the world's largest volunteer effort for ocean health.

## MANAGING THE WATER ISSUE

Water quality: chemical oxygen demand (COD)



### Proactive steps to achieve improvements

As a major user of water – for production, cooling and cleaning purposes – the chemical industry recognises that good water management must be an integral part of its sustainability journey. Water quality in terms of reducing pollutants emitted and improving containment methods, for example, has been addressed over a long period of time, and together with other measures has helped restore the natural biodiversity to waterways. Some companies have even developed thriving wetlands and wildlife habitats on and around production sites.

The chart illustrates COD – chemical oxygen demand – the potential of chemical emissions to water to remove dissolved oxygen that would otherwise support fish and other aquatic life. European data plus additional Cefic analysis shows organics in waste water generated by the EU chemicals industry fell by 46% from 2004 to 2009. It is not possible to offer any conclusive findings based on the publicly available data under E-PRTR because of the short timeframe. According to industry data for 2008 based on a matched sample from 21 countries, Responsible Care companies reported a 37% reduction in COD compared to 2003.

## Crucial to water management

Chemistry's contributions to society in terms of products to manage water delivery and ensure water quality are an essential part of water management. More than 90% of European drinking water is made safe with the help of chlorine, for example.

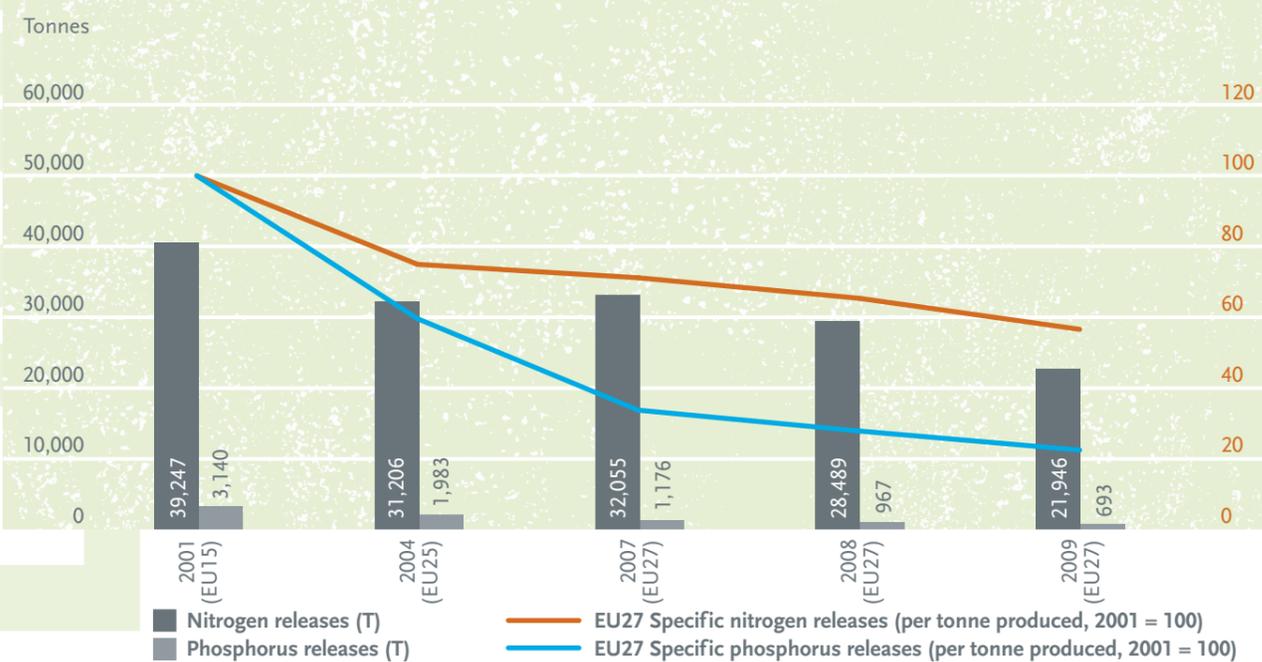
In Europe, over 19 million tonnes of chlorine, caustic soda and hydrogen – vital for sewage and industrial effluent treatment – are produced annually. Euro Chlor represents the chlor-alkali sector whose products have input into around half of all European chemical industry turnover. Euro Chlor has had an active sustainability programme in place for more than a decade.

Plastic pipe systems offer the best possible solution for conveying valuable drinking water, both when it comes to avoiding water loss (leaking inside out) and when it comes to protecting the water quality from potential pollution (leaking outside in).



## AN ESSENTIAL BALANCE

Nitrogen and phosphorus releases, EU chemical industry



Source: E-PRTR (The European Pollutant Release and Transfer Register), Eurostat and Cefic Analysis

### Measuring & monitoring mean better control

The E-PRTR and previous reporting mechanisms are valuable tools; and in the longer term, E-PRTR will enable industry to closely monitor its environmental performance. Latest data for 2009 for the chemical sector show that releases of nitrogen (N) to water fell 31.5% since 2007, and fell 41% for phosphorus (P). Over the five-year period from 2004, using Cefic analysis, the decline in releases of N is slightly more, at just under 30%; and considerably higher for P at 65%.

Both elements are found naturally in, and are essential to, healthy ecosystems. But unnaturally high levels – often a direct result of human activities including use of agricultural chemicals and detergents among

others – lead to eutrophication of vital water bodies including lakes, streams, rivers, estuaries and oceans. Under Responsible Care reporting, Cefic's matched samples of 20 countries showed 2008 nitrogen emissions to water down 33% since 2003, and a 55% decrease for phosphorus.

### Chemistry providing solutions

Finding the right balance – in other words, meeting demands of consumers for effective products as well as meeting the demands of sustainable development – has long been an important driver for industry's research and development efforts. Examples include the detergent sector's development of new detergents back in the 1970s, through to the ongoing introduction

of improvements enabling reductions in both chemicals and packaging used per wash, without loss of performance, since the 1980s.

Another important branch of the chemicals sector, Fertilizer Europe, has boosted its commitment to sustainability with a renewed focus on implementation of product stewardship. This programme encompasses the product life cycle, risk management, communication and partnerships. It enables companies to ensure that fertilizers, their raw materials and related products are safely managed with regard to health, occupational and public safety, environment, and security.

## WORKING TOWARDS A SUSTAINABLE SUPPLY CHAIN

### Low-carbon logistics

Less than 1% of all EU GHG emissions come from the chemical sector's transport operations. Nevertheless industry undertakes proactive measures to reduce the environmental impact of its logistics activities, working with partners to build a sustainable supply chain.

In 2010 Cefic published a study carried out by professor Alan McKinnon on measuring and managing CO<sub>2</sub> emissions of European chemicals transport<sup>1</sup>. Based on this study, we worked with the European Chemical Transport Association (ECTA) to develop industry guidelines which offer a common methodology for the calculation of transport emissions and provide a generic overview of opportunities and approaches for companies to reduce their emissions. This helps companies to better understand their current carbon footprint and develop low-carbon strategies for their logistics operations.

### Successful partnerships

Cefic has developed best practice guidelines in co-operation with the logistics industry, aiming at improving HSE standards and the performance of chemical logistics. We have partnered with the European Association of Chemical Distributors, Fecc, over many years on implementation of Responsible Care – addressing issues such as health and safety, emergency response, and risk management. More recently, ECTA signed a partnership agreement with Cefic in 2009 and launched the first Europe-wide Responsible Care programme in the logistics field.

A growing number of chemical companies use Cefic's Safety and Quality Assessment Systems (SQAS) for evaluating the safety, security, quality and environmental standards of their logistics service providers. SQAS is an important element of Responsible Care applied to logistics operations. It now covers all key service providers in the land-logistics chain: road transport companies, intermodal operators and terminals, rail carriers, rail tank car maintenance workshops, packaged goods warehouses and tank cleaning stations.

A similar scheme has been developed for chemical distributors, in co-operation with FECC, and the same concept has been applied for sea and barge transport through the Chemical Distribution Institute and the European Barge Inspection Scheme. SQAS helps logistics companies to identify areas for improvement and assists chemical companies in evaluating their service providers. More than 3,000 of these assessments have been carried out across Europe to date.

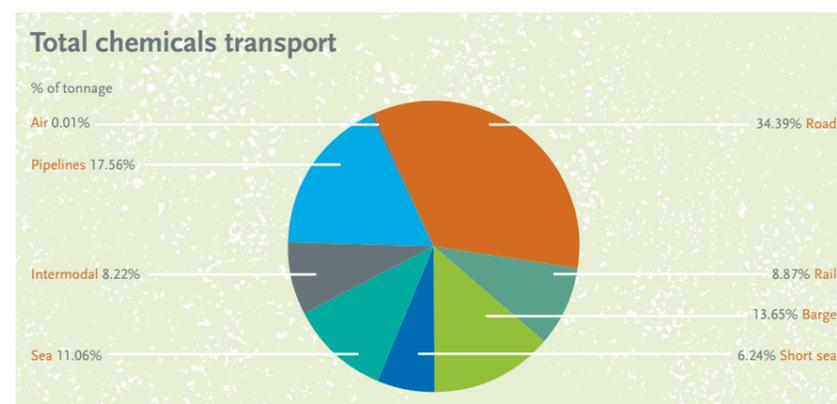
### Modal split

According to a 2008 Cefic survey, road transport only represents around 35% of the total volume of chemicals moved by all transport modes and 42% of the total inland transport volume. Compared with other European industrial sectors, we make far more use of alternative modes. The chemical and logistics industries have invested heavily in new infrastructure in recent years, resulting in a significant increase in the use of intermodal transport.

### Sustainable strategies

Efficient, competitive and sustainable logistics are essential for the future development of the European chemical industry. A joint Cefic/ Deloitte Chemical Logistics Vision 2020 report recommending the development of sustainable logistics strategies and related activities responds to the European Commission's White Paper strategy for competitive and resource-efficient transport systems<sup>2</sup>.

1. [www.cefic.org/Industry-support/Transport-logistics/Sustainable-Logistics/](http://www.cefic.org/Industry-support/Transport-logistics/Sustainable-Logistics/)  
2. [www.cefic.org/Industry-support/Transport-logistics/Chemical-Logistics-Vision-2020/](http://www.cefic.org/Industry-support/Transport-logistics/Chemical-Logistics-Vision-2020/)



Source: Cefic 2008 Survey on transport

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## Mobilising industry's expertise

Under the Responsible Care programme, our industry makes every effort to transport goods to and from manufacturing sites and storage locations safely and in full accordance with relevant regulations and codes of practice. ICE (Intervention in Chemical Transport Emergencies) is a co-operative Europe-wide programme, set up by industry to achieve this goal. Nevertheless, accidents do happen, and ICE means our member companies are ready to provide information, practical help and, if necessary and possible, appropriate equipment to the competent emergency authorities in order to minimize any adverse effects. In a leading chemical manufacturing country like Germany, the national ICE programme, TUIS, provided professional help in some 1,000 transport accidents involving chemical products in 2009.





“... the environmental dimension is quite naturally tackled by chemical companies but if we want to reach the objectives of the macroeconomic goal of sustainable development, firms also need to improve social aspects: internal aspects [such as] wellbeing of workers, stress management, motivation, etc, plus external aspects [such as] wealth of population around the firm, public health, etc.”

NATHALIE CRUTZEN,  
Accenture Chair in Sustainable Strategy,  
HEC-Management School  
of the University of Liege

# THE PEOPLE

## THE SOCIAL PILLAR

At the very heart of our industry are its employees – many of them university educated, highly trained and skilled personnel. The European chemical sector provides direct jobs for an estimated 1.16 million people, and around twice that through indirect jobs along the value chain. In order to retain this workforce, and attract the next generation of researchers, engineers, managers and line workers, industry needs a robust and supportive framework in which to operate effectively and meet societal expectations. Cefic is looking closely at the issue, building on the recommendations of the 2009 report from the European Commission’s High Level Group on the Competitiveness of the European Chemical Industry.

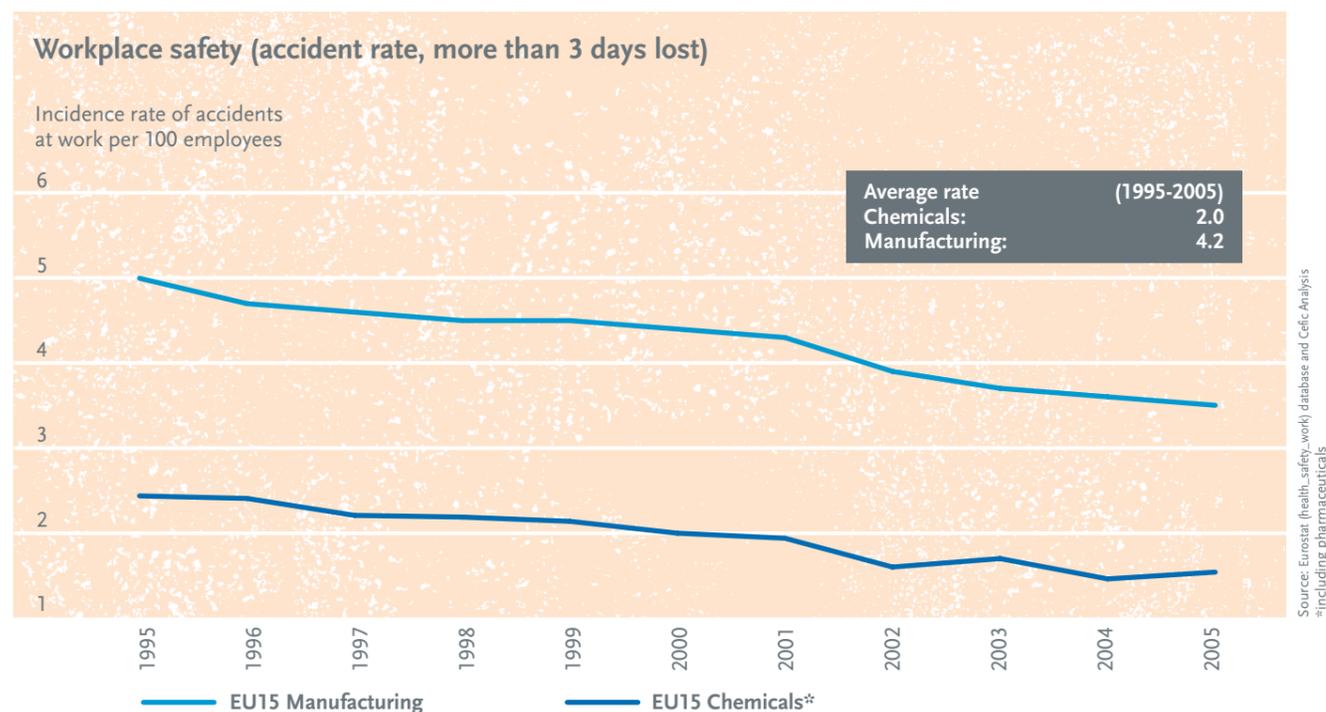
Demographic change – particularly population ageing and shrinkage of the working population – is having a profound impact on all industry, including the chemicals sector. The issue is being addressed in close cooperation with the Social Partners at both European and international level. These changes put pressure on the availability of the skills so essential to the sector’s success, and require taking a new look at how to tap into unused potential such as the female working population, particularly the highly educated.

As well, our industry’s outreach to young people is particularly important at a time when the number of students pursuing science as a career continues to decline. Our sector must do more to change its public image. We believe we can improve the perception of the chemical industry held by many of our stakeholders by being open and transparent as well as by improving awareness of, and demonstrating, the societal benefits of our products reinforced by our drive for sustainability.

### Key Performance Indicators

Employee safety is paramount	28
An important employer but numbers shrink	31
Steady rise in productivity	32
Balancing jobs & profitability	34

## EMPLOYEE SAFETY IS PARAMOUNT



### Twice as safe as the European manufacturing average

The chemical industry in Europe is highly regulated in terms of both its products and its operations, which helps ensure our employees work in a safe environment. The chemical industry is around twice as safe as overall European manufacturing; its expertise and commitment to high standards drive the pursuit for continuous improvement.

Through Responsible Care and the ICCA's Global Product Strategy, Cefic and its members are proactively committed to improving the health and safety of the industry's employees and are engaged in efforts to enhance chemicals management throughout the supply chain. Under Responsible

Care reporting, the lost time injury frequency rate (LTIR) has shown year-on-year improvement; in 2008 it stood at 6.6, the lowest on record for the matched sample of 21 Cefic national associations. The LTIR is reported as the number of accidents resulting in one day or more out of work per million worked hours.

At European level, industry has benefited from the partnership with two key stakeholders: the European Chemical Employers Group (ECEG) and the European Mine, Chemical and Energy Workers' Federation (EMCEF). Based around the Responsible Care initiative, the Social Partners have provided an effective mechanism to focus on high standards of health and safety in the workplace for nearly a decade. The Social Partners and Cefic strengthened their cooperation in September 2011 with

the signing of the Common Declaration on "Framework conditions for a sustainable chemical industry in Europe".

Raising awareness of safe chemicals management by downstream users is an important activity for Cefic and the Social Partners. Effective, focused communications with concrete actions and clear targets have proved key to success. Joint activities include sector specific programmes: in the polyvinyl chloride industry efforts focused on a life cycle approach; a successful initiative to improve behavioural safety in the polyurethanes industry eventually went global; outreach by the solvents sector on safe working practices reached tens of thousands of SMEs; for cyanides, the focus was on handling through the entire value chain and customer auditing; and best practices and communication were spotlighted by the formaldehyde industry.

## Working with customers

The chemical industry has achieved improvements in many areas through increased cooperation and partnerships through the value chain. In the case of the solvents sector, ESIG member companies help their customers evaluate air quality plans and find the most cost-efficient improvements. For example, identification of a suitable abatement system at the Belgian plant of an international ink manufacturer reduced emissions from the stream by 98%, equivalent to some 150 tonnes per year. A leading ESIG company has published technical information on abatement and recovery options for solvent emissions – 'Recovery of organic solvents from off-gas streams' – which has been distributed to several thousand customers and other interested groups for over two decades.

### Continuous improvement

As well as working with employers and workers' organizations, Cefic focuses on raising awareness and capacity building through partnerships with the relevant European authorities and bodies such as the European Agency for Safety and Health at Work. We provide support for national associations' health and safety campaigns. We also develop tools and materials such as the Cefic 2011 Guidance on Process Safety Indicators which facilitates the development of universally applicable process safety metrics.

In 2010, Cefic adopted the European Responsible Care Security Code, designed to help companies achieve continuous improvement in security performance. The Security Code uses a risk-based approach to identify, assess and address vulnerabilities, prevent or mitigate incidents, enhance training and response capabilities, and maintain and improve relationships with key stakeholders and authorities.

### Target zero

These efforts would be for nothing if it were not for the rigorous attention to health, safety and security paid by the companies themselves, large and small, which make up the European chemicals sector. Leading with innovative and responsible approaches to both processes and products helps keep people healthy and safe. Our member companies invest in new technologies and state-of-the-art equipment. They implement tried and tested behaviour based safety (BBS) programmes and global information systems. And they engage with stakeholders, up and down the supply chain, and beyond the fence line into local communities. The leaders in this industry set the bar high.

Cefic also runs an annual Awards scheme to recognise outstanding examples of Responsible Care. Every year, excellent health and safety initiatives aimed at employees, contractors, the supply chain and beyond are among entries submitted via member chemical associations from across Europe. The examples are shared through the internet and Responsible Care reports.

But every accident and, even more so, every fatality in our industry is one too many. The target is zero accidents and zero fatalities, and we will encourage, support and mentor our member associations and companies to strive towards this goal.

“The dreams of the ‘60s as a never-ending [growth] story, both economically and socially, of producing more wealth and creating more work places, are over now. Nevertheless... the employees, our members, are a crucial part of this industry: highly skilled and with decent pay – some would say high-value added – and the heart of the innovation within the industry. Even health and safety conditions at the work place are “cutting edge”.

MICHEL WOLTERS, EMCEF Secretary General, speaking at the signing of the ECEG/EMCEF/Cefic Common Declaration on “Framework conditions for a sustainable chemical industry in Europe”, Brussels, 6 September 2011

## Partnering with the United Nations

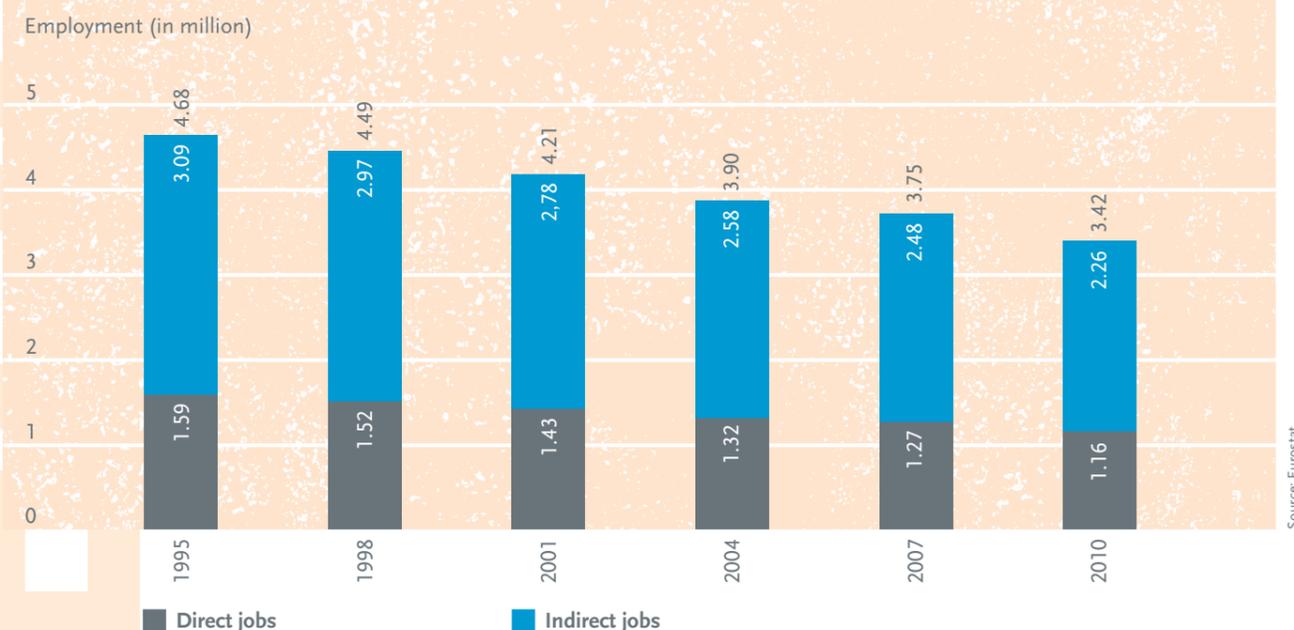
Individual companies are partnering with United Nations agencies to make progress towards achieving the Millennium Development Goals (MDGs). Since 2007, one world leader in vitamins and nutritional ingredients has been helping fight hunger and malnutrition, and to raise awareness of malnutrition, by providing technical and scientific expertise as well as products. It has developed tailored solutions specifically designed to meet the nutritional requirements of those in the developing world, and many employees are actively involved. More recently, another partnership agreed beginning 2012 involves leading companies combining their areas of expertise to develop solutions to reduce zinc deficiency affecting 100 million people in developing countries by 2015.

“We need to break the links between poverty, food insecurity and malnutrition. This requires the full engagement of many sectors and actors, including the private sector.”

BAN KI-MOON,  
UN Secretary General

## AN IMPORTANT EMPLOYER BUT NUMBERS SHRINK

Employment in the EU chemical industry (direct and indirect)



### Numbers falling an average 2.2% per year

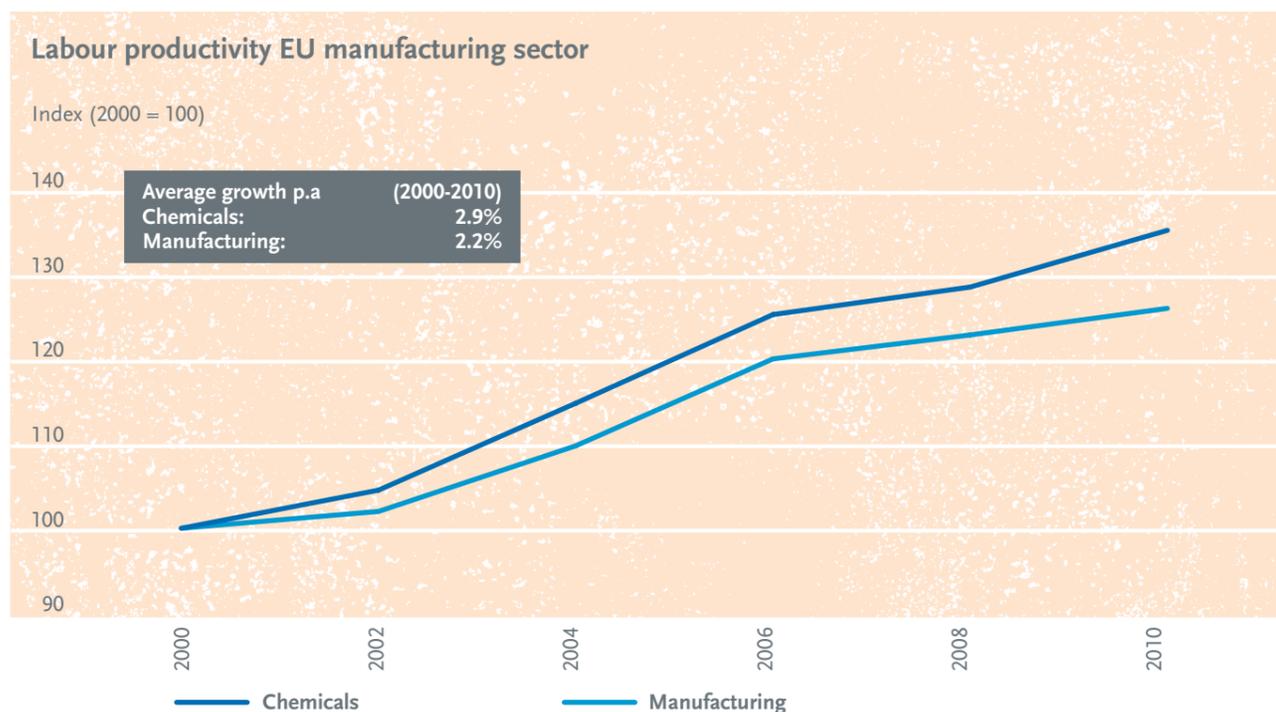
Chemical companies in the EU provide a high standard of employment for roughly 1.6 million people, as well as creating a further 2.2 million-plus indirect jobs. The industry has invested over the long term in building a skilled and productive workforce, with highly educated and trained employees. Nevertheless, employment in the industry has decreased by an average annual rate of 2.2% over the period 2000 to 2010, mainly a result of efficiency improvements that help balance the relatively high cost of labour in Europe.

The latest available data shows that the EU chemicals industry accounted for 3.6% of the total number of employees in the European manufacturing sector as a whole.

### Working with Social Partners

Cefic and the Social Partners believe industry plays an important role in meeting society's future challenges. Efficient and high-level education and vocational training as well as quality employment are priorities and responsibilities shared by the chemical industry in cooperation with workers' organisations and the relevant authorities. The partners recognise the need to work together to anticipate change and prepare for future challenges facing industry. The Social Dialogue at both European and global level, through the International Labour Organisation, develops recommendations on topics such as demographic change and restructuring.

## STEADY RISE IN LABOUR PRODUCTIVITY



### Global competition

Intensifying global competition over a decade or more has forced the EU chemicals industry to take cost-saving measures and vigorous steps towards restructuring in order to improve its competitiveness. As a consequence, labour productivity in the sector has been growing at an average annual rate of 2.9% between 2000 and 2010. This compares with a growth rate of 2.2% for the manufacturing sector as a whole over the same period.

Within the overall European manufacturing sector, chemicals is at the forefront in terms of value-added per employee.

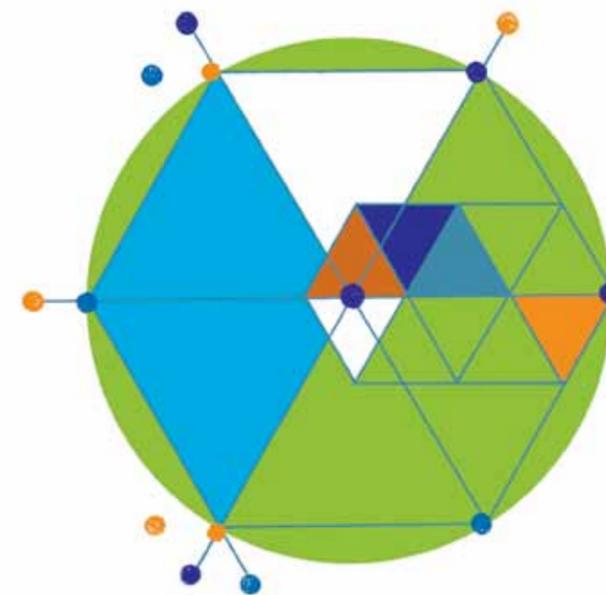
European data shows that the chemical industry's value added per employee (including pharmaceuticals) is 98% higher than the combined average for all manufacturing sectors.

As acknowledged by Cefic and the Social Partners, ECEG and EMCEF, in their Common Declaration on a sustainable chemical industry: competitiveness is crucial for an industry in order to ensure growth and profitability, as well as to protect and develop jobs, together with workforce terms and conditions.

Cefic works with the Social Partners on all issues relevant to the future of our industry. This continuous cooperation is of key importance.

**“Sustainability is about ensuring the long term viability of mankind and the planet. It can only be achieved by the collaboration of each individual on the planet, whether in government, academia, industry or society at large.”**

Quote from International Year of Chemistry, Young Leaders Group

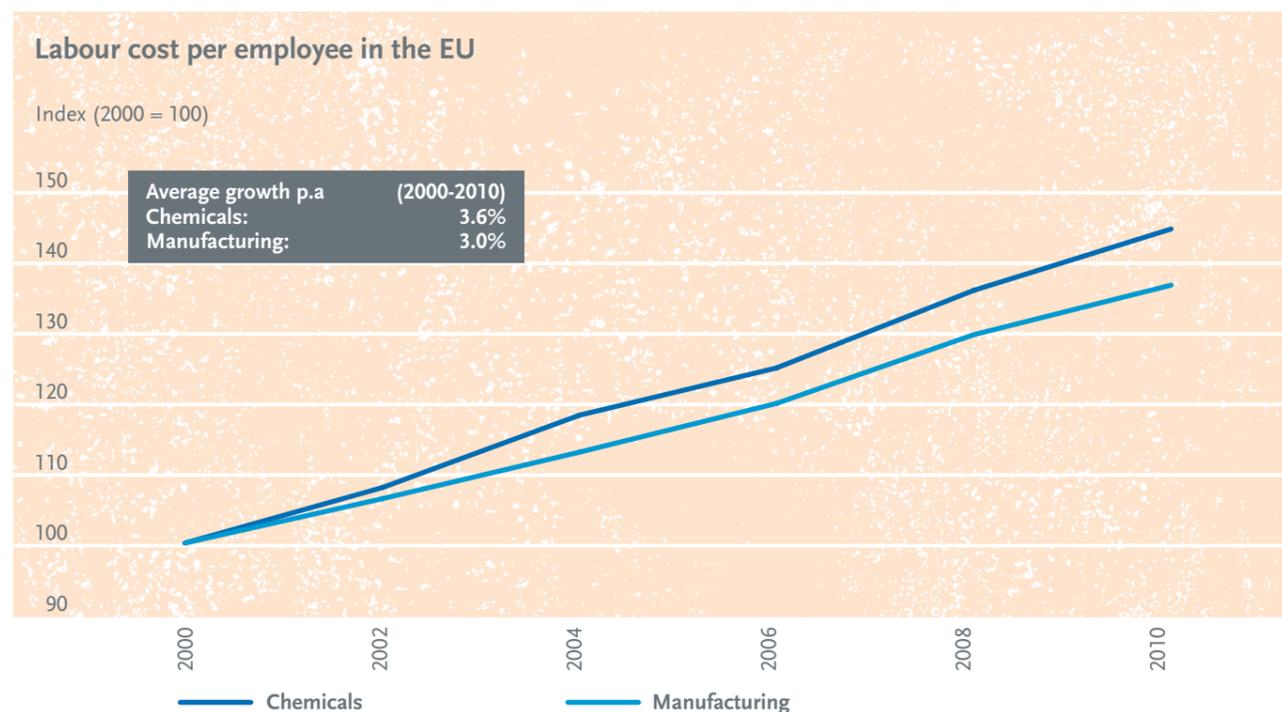


### Skills for the future

Cefic is addressing recommendations from the European Commission's High Level Group on the Competitiveness of the European Chemical Industry, published in July 2009. We initiated a study to investigate the critical skills – business, personal, scientific and technical – that scientists and engineers will need in the future. Together with the Social Partners, Cefic is also focused on the more general skill sets vital to the chemicals sector. In April 2011, they signed a “European Framework Agreement on Competence Profiles for Process Operator and First Line Supervisor in the Chemical Industry”. As well ECEG and EMCEF have initiated an EU-funded project on the feasibility of setting up a Sector Skills Council at European level.

The Social Partners are looking at the development of strategies and measures to overcome the effects of demographic change and the economic crisis on the European chemical sector. The phenomenon of ageing workforces and skills shortages is an ongoing issue being addressed by Cefic and the Social Partners.

## BALANCING JOBS AND PROFITABILITY



### Labour costs up 42%

This industry is a highly demanding sector involving complicated, often hazardous processes and cutting edge technology. Chemical industry employees benefit from high standards of education, lifelong learning programmes and vocational training; many are university-educated or equivalent. Personnel costs for the EU chemicals industry have risen faster over the past 10 years than the average of other manufacturing sectors.

Figures show that the European chemical industry is the lead sector in terms of labour cost per employee, and this has increased an average 3.6%/year between 2000 and 2010 against 3% for EU manufacturing as a whole. The labour cost per employee is 42% higher in 2010 compared with

ten years ago. This too is significantly higher than the 34.9% increase for EU manufacturing as a whole over the same period.

### Attracting talent

Good salaries are important to attract and retain new and young talents to work for the industry. At the same time, Cefic and its members are working to change the public's generally negative perception of industry and raise awareness of its contributions to sustainable development; our aim is to make chemistry and our business an even more attractive employment option. Demographic change and skills shortages make recruitment an additionally critical issue for the sector. Throughout 2011 the UNESCO-backed International Year of Chemistry featured a host of high-profile, positive

outreach efforts to engage with the public, particularly students, as well as with governments, academia and other stakeholders.

IYC 2011 also highlighted the important of women in science, building on the 100th anniversary of the award of the Nobel Prize in Chemistry to Marie Skłodowska-Curie. That said, a joint study involving the European social partners of chemical industry demographics (covering seven countries together accounting for over 70% of sector employees) showed the share of women working in the sector in 2008 was lower in the chemical industry than in the working-age population as a whole. While roughly 50% of the working-age population were women, their share was only between 30-44% in the chemical industry in the seven countries studied.

“Social dialogue is crucial to economic and social progress and when I read [the Common Declaration], I was impressed by its holistic integrated approach to industrial policy which it tackles under three headings: environment and sustainability, society and the implications of population change for worker’s skills and qualification and the role of growth and competitiveness for our economy.”

LÁSZLO ANDOR, European Commissioner for Employment, Social Affairs and Inclusion

## Partnerships & dialogue

We fully support a broad EU growth and jobs policy that focuses on the manufacturing sector and coordinates policies for industry, employment, environment, research, the internal market, and trade. We believe this approach is in the interest of European society as a whole.

At international level, we will continue to cooperate with the industry in other regions of the world to develop global governance and transparency through Responsible Care and other voluntary activities, improve the coordination of legislation, and strengthen our links with stakeholders and partnerships with international organisations. Such cooperation is an integral part of our industry’s contribution to sustainable development under its commitment to societal progress.

“We often forget that chemistry is at the basis of most inventions and innovations which created our wealth and make our lives convenient... Chemistry and its applications are everywhere, making our modern life possible.”

ANTONIO TAJANI, Vice-President of the European Commission, speaking at the opening ceremony of the ‘Tomorrow Starts with Chemistry’ exhibition in Brussels, September 2011



# PROFIT

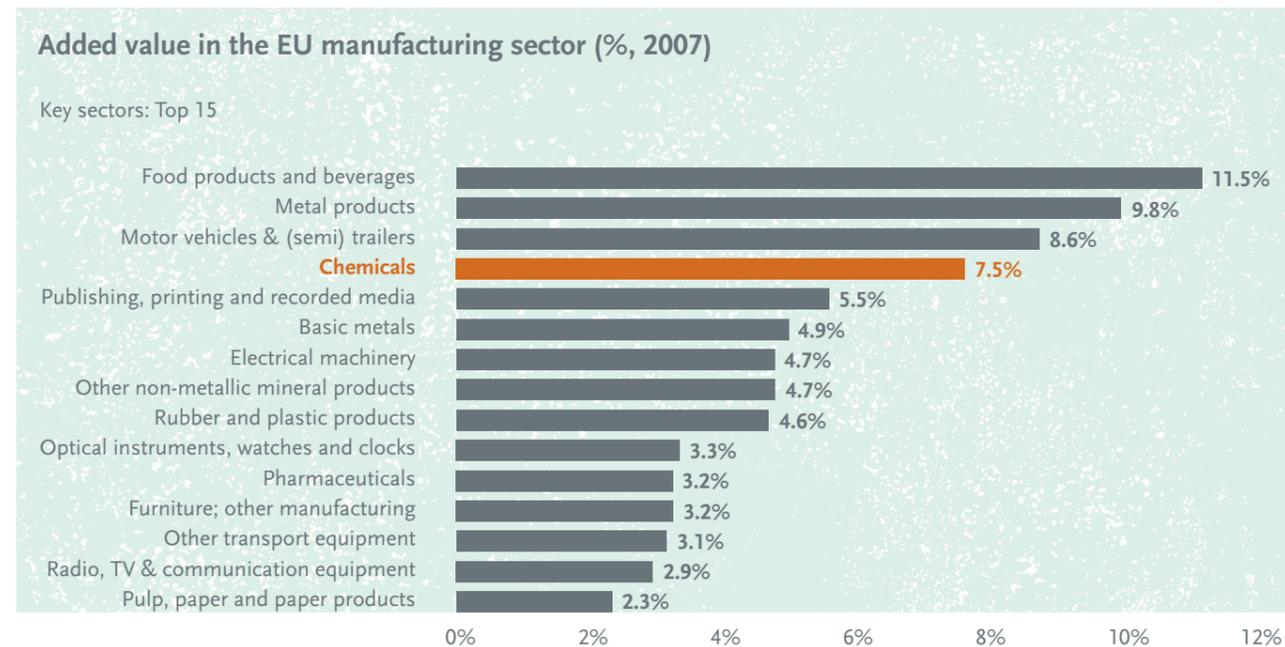
## THE ECONOMIC PILLAR

The chemical industry is one of Europe’s leading manufacturing sectors, competing at the global level. But there is no doubt that its competitiveness and ability to retain market share are under intense pressure from other parts of the globe. For investment in production, in innovation, and in research and development to continue, industry needs the right economic and legislative framework to help it exploit new partnerships and new opportunities.

### Key Performance Indicators

Chemistry: a business based on adding value	38
A leading European sector	40
Essential to maintain profitability	42
Europe’s future relies on investment	44
R&D: key to success	46

## CHEMISTRY: A BUSINESS BASED ON ADDING VALUE



### Providing essentials

In terms of added value in the EU manufacturing sector, chemicals ranked fourth with 7.5% in 2007. The chemical industry is a world leader in using energy to transform basic raw materials into high value products that are an essential part of our daily lives. The products of chemistry are the main formulation ingredients of many consumer products such as detergents, cosmetics, fuels, paints and pharmaceuticals, which are manufactured and marketed by downstream users in those industries.

Our products also provide major functional benefits to other industries like agriculture (in the form of fertilizers, pest control products), building and construction (coatings, adhesives, insulation, air filtration materials, additives for building materials), automotive (paints, lightweight plastic parts, lubricants) or IT and engineering (solvents, insulation).

And of course, chemicals also provide the basis of a wide variety of packaging materials – from bottles and boxes to foils and wraps – that are used widely across all industries.

### Future opportunities

There are opportunities for growth in Europe over the next decade. Cefic members are actively working to strengthen the chemical industry's potential as a key part of the solution in clean technology-related value chains such as solar, automotive batteries, bio-fuels, lighter-weight materials, insulation, and urban mining to name but a few. The nature of the chemicals business – providing raw or semi-finished materials for many key sectors of the economy – generally means the further down the supply chain, the higher the added value.

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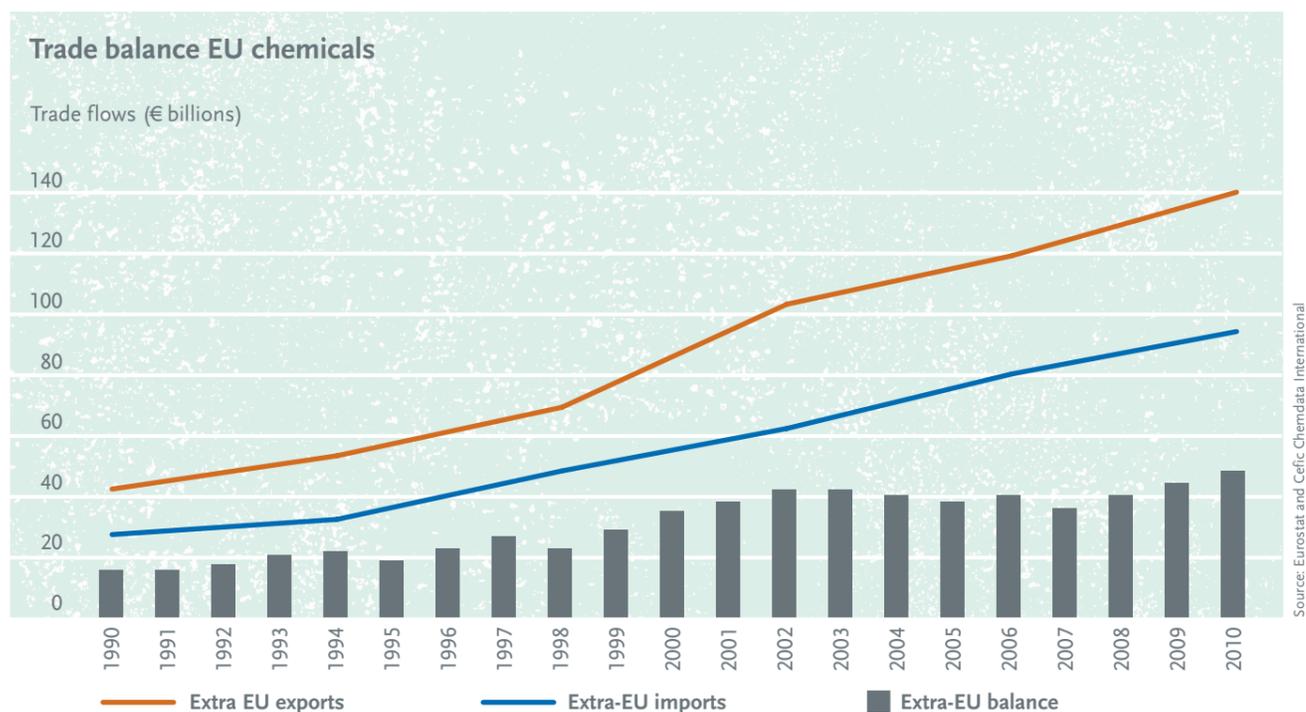
## Building sustainability through the value chain

Today's chemical industry products are essential to development of a sustainable construction sector, ensuring buildings become ever more efficient in terms of their use of resources. Their use to fulfil important functions such as insulation increases the added value of products. Insulating materials are available in many forms and provide a simple but very effective way to stop wasting energy used to heat or cool buildings. Polyurethane (PU) or polystyrene (PS) rigid foam panels, for example, have excellent insulation properties and are especially thin, too, thanks to the chemistry of special foam stabilizers. The construction industry uses these panels to insulate walls, roofs, floors, and ceilings.

During their useful lives, plastics insulating materials save many times the amount of energy needed to produce them: in most cases, the energy expenditure for production has paid for itself after the very first heating period, while even the relatively high costs of the materials are recovered within a few years.

Furthermore, these materials are stable and durable, they are not affected by moisture, rotting, or mould. They have a very low environmental impact during production and installation. And after a useful and long life phase (around 50 years), plastics materials are easily and completely recyclable or recoverable, either mechanically or thermally.

## A LEADING EUROPEAN SECTOR



### Record trade surplus but market share falls

As an historically important player in the global chemicals market and a major contributor to the EU's overall trade balance, the chemical industry continues to be in a position to benefit from trade opportunities. In 2010, the EU chemicals sector generated an extra-EU trade surplus of €47 billion, €4 billion more than in 2009.

However, this position is under increasing pressure from fast-growing economies, mainly in Asia and the Middle East. In global terms, the percentage of chemicals manufactured in Europe has decreased from 36% in 1991 to 21% in 2010, although output still rose by 17% in value terms (see opposite page). The European chemical industry must build on its strengths in innovation, quality and sustainability to ensure a healthy market demand for its products is maintained.

Our industry is one of the most globalized sectors, exporting to third country markets, importing substantial amounts from third countries and investing in high growth markets. In 2010 exports amounted to €140 billion. The EU is still the world's top exporter and importer of chemicals, accounting for 41% of global chemicals trade in 2010 (defined as the total value of exports plus imports), and including intra-EU trade. Just under 30% of chemicals sales are exported to non-EU markets.

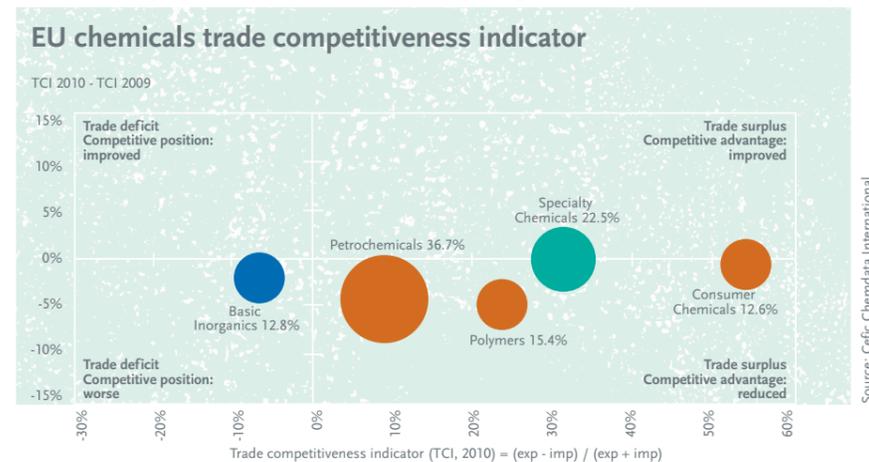
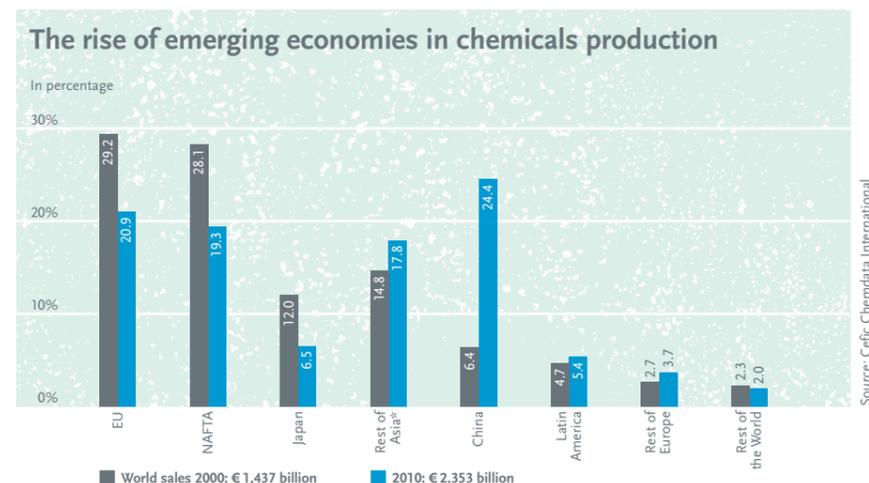
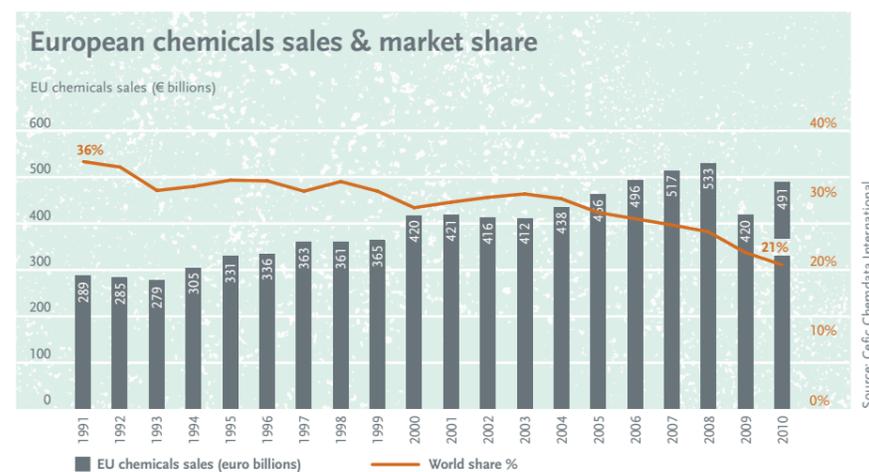
### A resilient business

In a demonstration of its inherent resilience, the EU chemicals sector registered a solid recovery in 2010 after the 2009 economic crisis. The trade surplus outside the EU reached a record level in 2010 and remains a key driver for the sector's growth and competitiveness. The main trading regions were the EU, Asia including China and Japan, and the market comprising North American Free Trade Agreement countries.

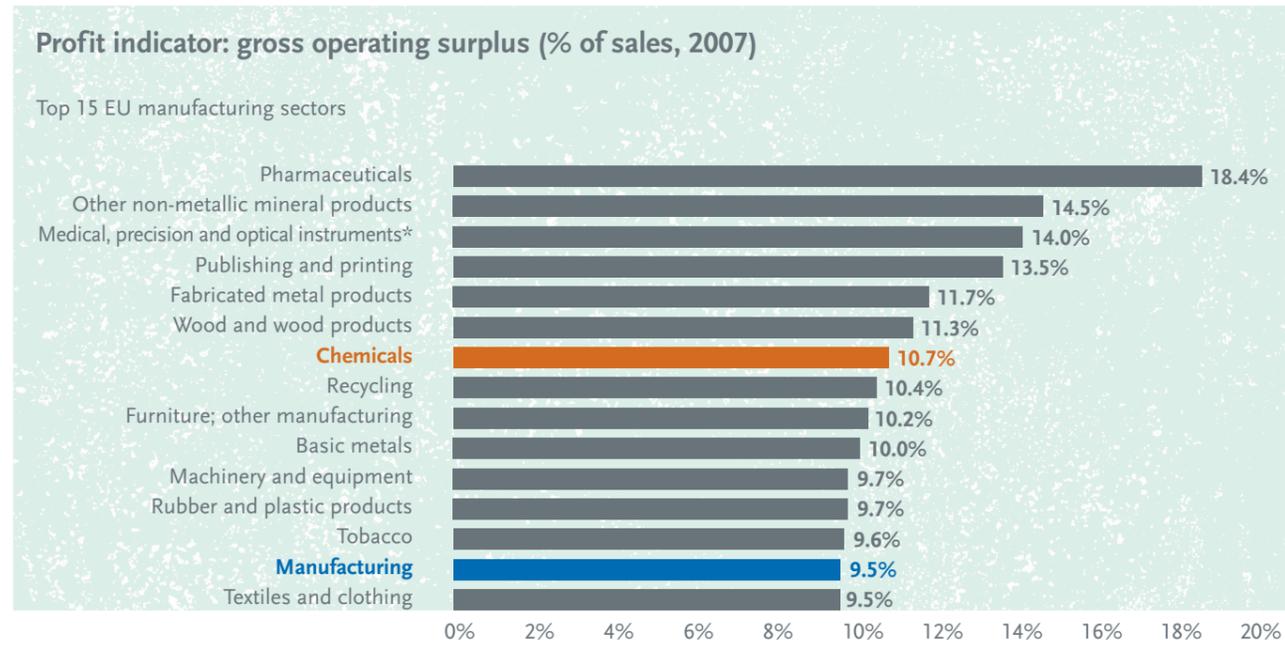
However, with continued uncertainty characterizing both the global and European economic outlook, there is little doubt that industry will continue to find itself under pressure. Asia and the Middle East will become the epicentre for the global chemicals industry – by 2010 Asian chemical production had equalled that of Europe and the Americas, and China's share of world chemical sales had increased from 6.4% in 2000 to 24.4% a decade later.

Investing in the chemical sector is investing in the future as industry efforts are increasingly directed towards developing specialty products and services that help customers and society to reach sustainability goals. Europe's ability to innovate, leading-edge product safety management and environmental standards, and a strong legislative framework are supported by a solid, high-performing logistics infrastructure.

It is therefore essential that Europe's regulatory and financial infrastructures offer the optimum conditions for our industry to focus on its strengths and, when the climate is right, to thrive.



## ESSENTIAL TO MAINTAIN PROFITABILITY



### Innovating for sustainability

Statistics show that the EU chemicals industry has a Gross Operating Surplus (GOS) higher than the overall manufacturing sector average. GOS can be taken as a proxy of profitability, and continued profitability will ensure the continued investment needed to keep the industry competitive.

GOS intensity in the EU chemicals industry (calculated as the ratio of GOS to sales) was 1.1 times the level of the overall EU manufacturing sector average, and the seventh highest of all EU manufacturing sectors.

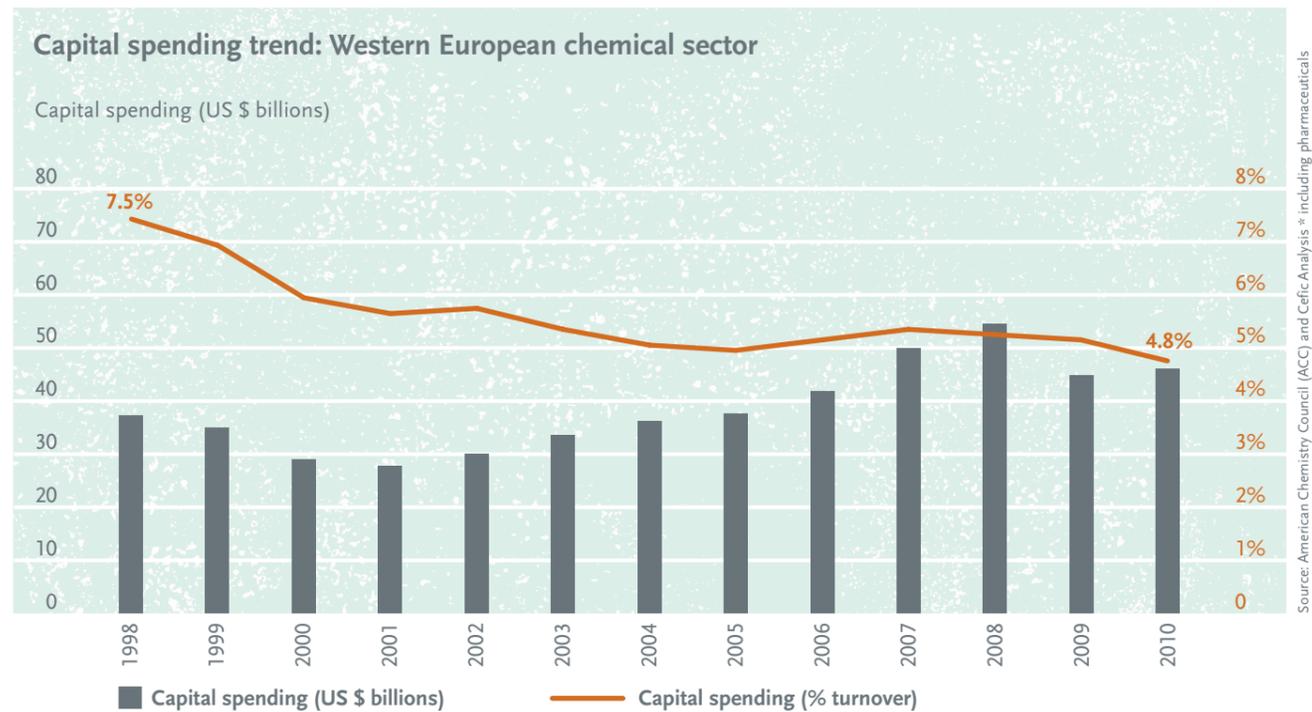
Improving industry's sustainability means real economic benefits: it adds to company profitability by reducing costs based on using fuel and feedstock more efficiently, and by eliminating waste for example. Innovating for sustainability – increasingly through private-public partnerships – is also critical to improving both sales and profit margins. We are also well-aware of, and will build on, the importance of non-tangibles such as the contribution that improved sustainability makes to reputation and to attracting high-quality employees.

“Investors are beginning to acknowledge the impact of sustainability topics on a company’s financial valuation. By adopting effective product life cycle assessment strategies chemical companies can realign their portfolios towards sustainable innovation and at the same time provide financial investors with increased transparency about their commitment to sustainability.”

ANDREA RICCI, Equity Analyst -  
Chemical Sector at SAM  
Sustainable Asset Management



## EUROPE'S FUTURE RELIES ON INVESTMENT

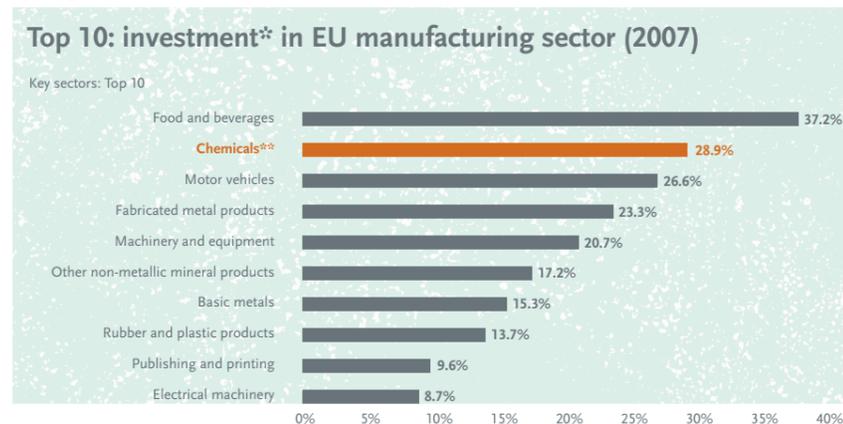


### Nearly €30 billion invested in 2007

The above table, based on American Chemistry Council statistics, shows the ratio of capital spending to sales of Western Europe's chemicals industry, including pharmaceuticals. The ratio has been declining for over a decade and stood at 4.8% in 2010, down from 7.5% in 1998. Industry statistics show that the Asia-Pacific region accounted for nearly 73% of global capital spending on chemicals in 2010, against 38.6% in 2000. That high level is set to continue fuelled by the region's ongoing development coupled with rising domestic demand.

European data for 2007, the most recent available, shows that around 2.3 million enterprises were operating in the EU 27 manufacturing sector, and generated €262.4 billion of gross investment in tangible goods.

As shown in the chart below, the largest three sub-sectors in 2007 were food & beverages; chemicals, including pharmaceuticals; and motor vehicles.



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## Intelligent combinations

It can pay dividends when companies put their heads together to combine individual strengths and come up with novel ideas. One such collaboration has resulted in an intelligent combination of renewable energy generation and efficient thermal insulation in the form of a solar air collector roof insulation system, made possible by a newly developed sheet technology based on a polycarbonate and rigid polyurethane foam. The air collector roof insulation system is laid like a roof and performs five functions at once, acting as a vapour barrier, thermal insulator, rainproof roof substructure, cladding and solar collector.

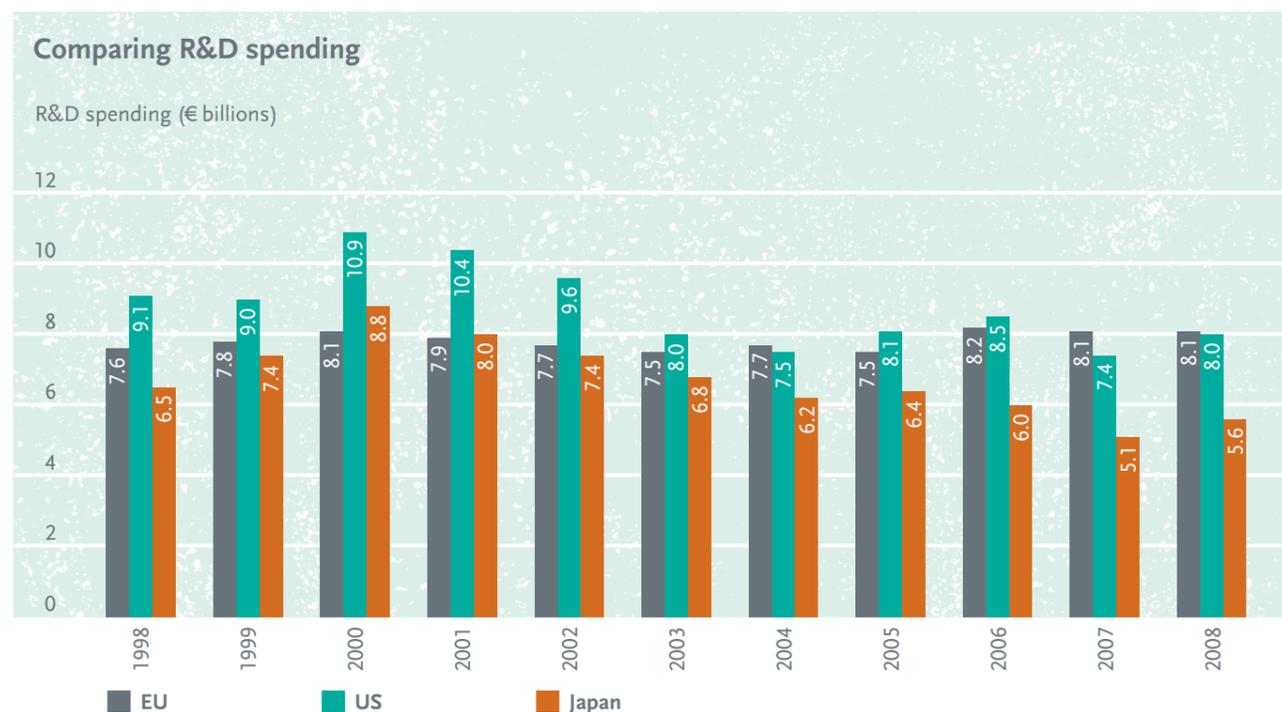
The result? Outstanding energy efficiency: the solar collector, made of highly heat resistant polycarbonate sheet, produces usable energy in the form of hot air which can be used directly for heating.

Combined, these three accounted for 35.3% of total 2007 investment, with chemicals, including pharmaceuticals, contributing €28.9 billion.

With countries outside the EU, particularly China, attracting the lion's share of chemical sector investment in recent years, Europe nevertheless remains a region with a strong and well-established chemicals platform with a home market of 500 million demanding customers. That allows investment to be diverted into high-end activities, as well as to upgrade existing operations, ensuring the industry remains state-of-the-art, competitive and an environmental leader compared with other parts of the world.

In its roadmap, "Chemistry for Tomorrow's World" London's Royal Society of Chemistry lists investment opportunities in seven priority areas: energy, food, future cities, lifestyle and recreation, raw materials and feedstocks, and water. It also identifies over 40 "challenges" and urges that industry work in partnership with governments, professional bodies, NGOs, and academia.

## R&D: KEY TO SUCCESS



### EU 2020 targets 3% of GDP for R&D

Horizon 2020, the European Commission's €80 billion package for research and innovation funding – part of the drive to create sustainable growth and new jobs in Europe – is welcomed by industry. The new programme, designed to make it easier for applicants to seek funding and help bring more good ideas to market, will run from 2014 to 2020 and brings together all EU research and innovation funding.

As a research-intensive business, Europe's chemical industry has an essential role to play in enabling achievement of the Commission's EU 2020 target of investing 3% of public and private GDP in R&D.

Europe needs a strong framework to encourage the investment needed to provide the platform for future innovation. It's a challenging task: Europe has lagged both Japan and USA for the past 20 years or more in terms of R&D intensity, and in all three blocks those levels are declining as other parts of the world – most notably India and China – continue to strengthen their capabilities.

### Bridging the gap

In 2011, the High Level Group on Key Enabling Technologies presented its recommendations to the European Commission. Cefic, as a participant in the group, intends to support and help realise these recommendations which we believe offer a blueprint to provide tools to bridge the gap between R&D and the marketplace.

Extending the definition of R&D to incorporate innovation will play an important part by allowing scale-up and faster development. Its recommendations support four of the six key enabling technologies, or KETs – nanomaterials, biotechnology, advanced manufacturing and advanced materials – and represent an important step towards EU 2020 policy goals for sustainable growth, including efficient use of water, energy storage, resource efficiency and health.

Cooperation up and down the value chain, and with key stakeholders, is essential. In 2010, for example, the European Association for Chemical and Molecular Sciences (EuCheMS) and Cefic agreed to identify areas for joint cooperation, including projects that come under the remit of the EU's Horizon 2020 initiative.

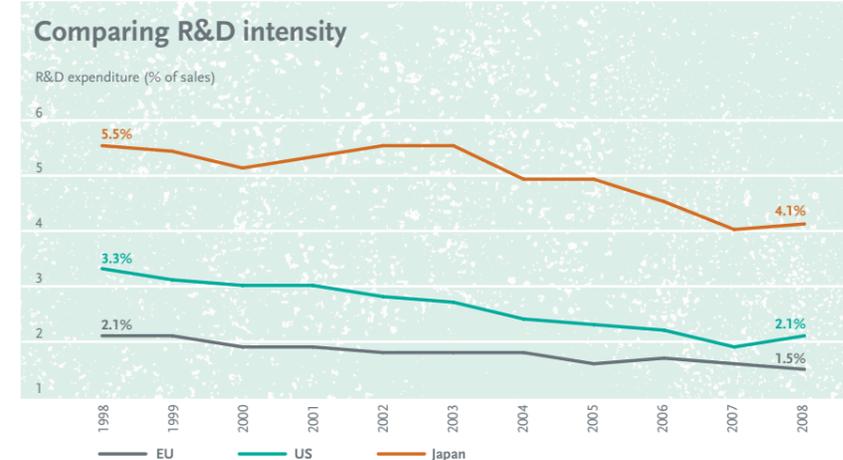
### Ethical R&D

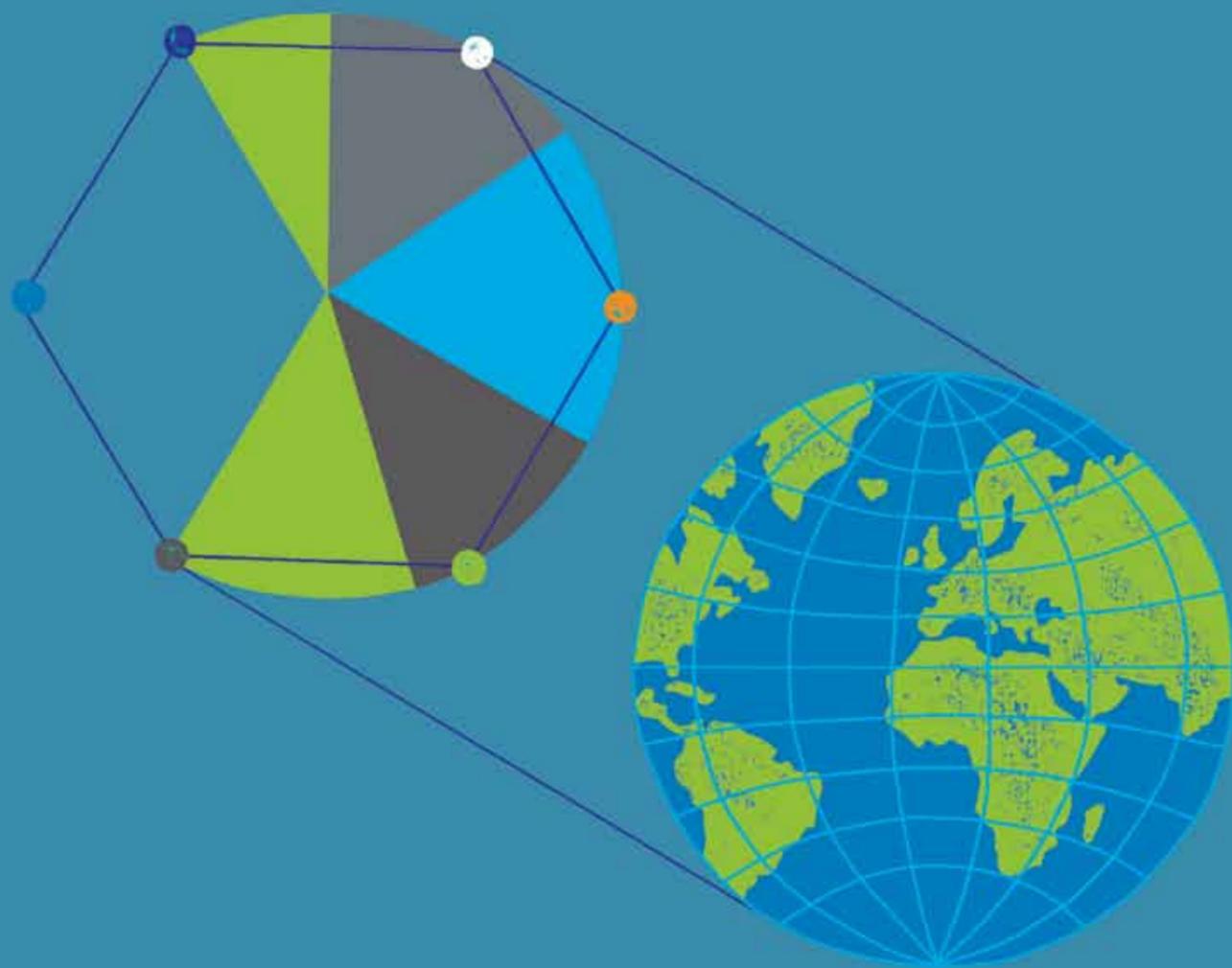
Our industry is well aware of the ethical challenge of animal testing to support R&D. We work with academia, regulators and NGOs to reduce these tests where possible, but at the current time stringent European legislation obliges us to do the testing. Cefic is a founding member of the European Platform for Alternatives to Animal Testing (EPAA), a joint initiative of seven industry sectors and the European Commission. Since the beginning of REACH, Cefic has pushed for the 3Rs (refine, reduce or replace) in animal testing, while at the same time not jeopardising required safety certainty. Within this ethical framework Cefic members are developing and sharing with the public its research through the Long-range Research Initiative (LRI).

The LRI programme is a successful and long-standing member-led initiative built on relationships with research programmes, government agencies, academics and non-governmental organizations.

“Horizon 2020 aims to make our investment in research and innovation simpler, more efficient, and more effective at delivering the bigger impacts needed to sustain growth and tackle the biggest challenges... The chemical industry is an important stakeholder that should play its role in tackling numerous societal challenges... I know that I can rely on all players in the industry to make an active contribution to our goals for both Innovation Union and Horizon 2020, by working closely together along the whole value chain, and by collaborating on a strategic research agenda in this domain.”

Commissioner MÁIRE GEORGHEGAN-QUINN at the closing ceremony of the International Year of Chemistry, 1st December 2011





“The substitution of harmful chemicals by less harmful ones remains a challenge for governments and the chemical industry. Holistic methodologies which take into account the complete life cycle of chemicals could improve the decision-making process. The chemical industry should take a leading role in developing and using such methodologies, building on existing work related to sustainable chemistry.”

SIMON UPTON, Director,  
OECD Environment Directorate

# 4

## LEVERAGING LEGISLATION & VOLUNTARY EFFORTS

While working towards the Cefic vision, industry needs a strong and effective approach to managing all aspects of its activities – which is what it has with the combination of strong European legislation and the chemical sector’s voluntary activities.

Those voluntary activities, in particular our Responsible Care initiative and the Global Product Strategy (GPS) with its life cycle approach, are important tools. They help us manage our business and meet the challenges posed by legislation, especially the Registration, Evaluation, Authorisation and Restriction of Chemicals – REACH. REACH is the main EU chemicals legislation, providing effective chemicals management and transparency through the supply chain.

REACH requires the assessment of the risk of substances and their uses during their lifetimes so that they do not have negative effects on human health and the environment.

This risk assessment provides the chemical industry and downstream users with more information on the substances they use and allows control measures that, in turn, direct the industry towards an even safer, more sustainable future.

We view REACH as a challenge but it is also an important driver for sustainability and an ongoing journey aimed at providing safer use of chemicals based on scientific understanding. By the end of 2018 all substances manufactured or imported in Europe will be registered with the corresponding technical dossiers. Beyond that, new, innovative products coming on to the European market will comply with REACH. In this sense, REACH helps increase transparency about chemicals and their use in Europe, which ultimately benefits consumers.

As a result, REACH increasingly can be seen as a reference in other regions and allows the European chemical industry to differentiate itself based on the fact that its processes and product portfolio meet stringent requirements. Our member companies can use this as a selling point in response to demands by increasingly affluent and well-informed local populations for products based on strong, properly enforced chemicals management standards.

Now in its third decade, Responsible Care is a key part of the global industry's contribution to the United Nations' Strategic Approach to International Chemicals Management (SAICM). Together with the Global Product Strategy, industry is answering stakeholder expectations for continuous performance improvement.

Responsible Care and the GPS provide frameworks for training, setting up working groups and services to support our companies and consortia in the different steps of REACH. We contributed to the development of guidance to help companies with compliance, and continue to provide additional support for small and medium-sized firms, preparing for the registration deadlines of 2013 and 2018 and evaluating the sustainability of their substances.

### **Locking in the life cycle approach**

This strong framework applies not just to products themselves, but to the whole product life cycle, from cradle-to-grave or even cradle-to-cradle. It means full consideration of the impacts of raw material sourcing, manufacture, packaging, transport and distribution, retail, use, and finally post-use recovery or disposal.

REACH has considerable impact on downstream industries, too, and they have three major expectations of suppliers relating to chemicals that are used and sold in products for final consumers.

Downstream industries seek targeted dissemination of risk assessments, taking into account fully the hazards and exposure of chemicals, enabling their safe use by humans and avoiding harm to the environment. In addition, they seek a full understanding and sharing of information relating to the environmental footprint of chemicals along the supply chain from manufacturing to disposal based on a life cycle approach. And, of course, they require innovative, high-quality products that deliver the best possible functionality and translate into consumer benefits.

With the chemical industry meeting these expectations under REACH legislation and fully supported by Responsible Care and GPS activities, all links up and down the value chain can cooperate in a life cycle approach. This avoids 'problem-shifting': it helps ensure that improvement in one part of a product or service's life cycle does not simply create a different problem in another place or time, or in another part of the environment.

## **Providing a leading edge**

The European Chlorinated Solvent Association (ECSA) has developed an online toolbox based on REACH dossiers for users of chlorinated solvents. The toolbox provides information about the safe and sustainable use of the products, and is built as a self-explanatory guide based on a simple decision tree of product applications. This takes users to the proper information on safe use, environmental protection and legislative requirements. It's an example of industry going beyond REACH by using information from the dossiers and developing tutorial materials for users.



“As we look at the major challenges facing society, it is clear that the European chemical industry and its partners have a crucial role to fulfil. The products of chemistry are making a positive and powerful difference to the sustainable development agenda. And given the right conditions, we will continue to channel our efforts into ensuring that people have access to the necessities of life, to economic prosperity and to societal progress.”

CARL VAN CAMP,  
Chairman, Sustainability  
Strategy Group



## INDUSTRY'S PRODUCTS: CONTRIBUTING SOLUTIONS

Energy and climate change, food and water, mobility and housing... three areas of major importance to European society and areas where the products of chemistry are bringing real and substantive benefits. Examples are many – in the following pages, we highlight just a few.

### ACTION ON SUSTAINABILITY AT ALL LEVELS

#### Europe-wide efforts

Certain products have attracted strong criticism from environmental groups and other stakeholders, and industry has taken action to address their concerns. For example, in 2000 'Vinyl 2010' was established as a ten-year voluntary commitment of the European PVC industry to collect and recycle 200,000 tonnes of PVC waste. These days PVC can be completely recycled, and by 2010 the target had been exceeded, with industry recycling an independently-verified 260,842 tonnes. The new initiative called VinylPlus has been developed by a concerted 'bottom up' approach through the entire industry value chain with an open process of stakeholder dialogue under the guidance of the Natural Step, an NGO dealing with sustainable development. It is monitored by an independent committee made up of stakeholders from European Parliament, European Commission, trade unions, academics and consumer organisations.

#### A national approach

Partnerships and voluntary agreements with government and local authorities have resulted in chemical industry initiatives that reduce waste, drive down emissions, conserve resources, and improve energy efficiency. In France, for example, industry is working with the authorities and other sectors on reducing material flows and waste, and promoting eco-design, reuse and recycling. It seeks to encourage more intensive use of goods – such as car-pooling – to extend service life, and to promote the 4Rs in a systematic approach. In a further move, several sector groups and companies have joined forces to create the "Association Chimie du Végétal" (ACDV) to develop a cutting-edge approach to bio-based chemistry.

#### Company focus

Industry's ongoing focus on using renewable raw materials is helping identify new ways of protecting the environment. Together with a biotech partner, one oil and gas firm is running an R&D programme to develop manufacturing technology for a transparent, printable plastic suitable for food packaging using polylactic acid (PLA) derived from sugar beets. An additional benefit is that the plant-based plastic is compostable and biodegradable. The same company has a comprehensive line of biodegradable lubricants, made partly from renewable resources. The lubricants have been designed to meet the specific requirements of operating machinery such as chain saws and tractors and prevent pollution caused by accidental spills of hydraulic fluids in sensitive environments like mountains, forests, rivers and lakes.



## ENERGY & CLIMATE CHANGE

### Visionary thinking

Surely one of the most inspiring and exciting examples of visionary thinking in Europe today is that of the Solar Impulse – the aircraft that aims to fly around the world without fuel or pollution, powered simply by solar energy. It is a partnership of several diverse entities characterised by forward-thinking and innovative people and companies. This plane, no heavier than a family car with its vast wingspan covered in solar panels, is a symbol of what is possible. It represents what the European chemical sector is striving for, and embodies the vision set out at the front of this report: we must invest in the science needed to develop new energy sources in order to achieve a future where people have access to the necessities of life, to economic prosperity and to societal progress.

In a single hour the sun delivers more than enough energy to our planet to satisfy our global energy needs for an entire year. Clever chemistry is essential to enable us to harness that energy. Falling prices and improved efficiencies are helping make solar energy ever more viable, and the chemical industry's advances in this area – combined with its input into other renewables such as the composites for wind turbine blades – will provide sustainable energy sources for future generations.

### Winds of change

According to the European Wind Energy Association (EWEA), more new wind power capacity – 39% of all new capacity – was installed in the EU in 2009 than any other electricity-generating technology. Taken together, renewable energy technologies account for 62% of new power generating capacity in 2009. Chemical manufacturers supply a range of materials for wind turbines including innovative epoxy resin systems for highly resilient, fibre-reinforced components as well as specialized coatings materials for rotor blades. Polyurethane foams, basic materials for formulating PVC foams and special PU-based adhesives are also used to manufacture these high-performance blades. EWEA's outlook for wind power development to 2020 forecasts 230 GW of installed capacity, producing 581 TWh of electricity and avoiding 342 million tonnes CO<sub>2</sub> emissions.

### Friendly fuels

Successful development and use of biofuels based on a life cycle approach is seeing results. In the past few years, commercial production of bio-methanol on a large industrial scale has become a reality. One company has developed an innovative process for converting crude glycerine – a by-product of biodiesel – into bio-methanol, thus closing the cycle. Other biomethanol processes use feedstocks like wood waste, algae and methane gas from landfills and animal waste. As a fuel, bio-methanol can either be blended with petrol, or it can be used as a feedstock for other environmentally-friendly fuels thereby helping fuel manufacturers to achieve EU targets. It is also used for a variety of non-fuel applications including plastics and paints.

### A greener greenhouse

Energy costs are a crucial issue for greenhouse operators needing cooling in the summer and heating in winter, and rising costs put ever more pressure on margins. The thermoplastic polymethyl methacrylate makes a valuable contribution to conserving resources. PMMA transmits more light than conventional glass and the use of multi-skin sheets in greenhouses offer an ideal energy balance. Their good heat insulation means less energy is required than with conventional glazing thus cutting costs and CO<sub>2</sub> emissions. At the same time, plants enjoy the high light transmission and the uniform, easily adjustable climate, helping operators grow good quality products in shorter timeframes.

### Ethanol and energy from waste

A processing technology developed by a leading chemical firm converts low value biomass waste to bio-ethanol and energy. This technology combines both thermo-chemical processing and fermentation. The yield of bio-ethanol production is 25% higher per dry tonne of biomass in comparison with current commercial processes and performs better than other current biofuels in terms of GHG emissions. A life cycle assessment shows that this process also performs significantly better than either landfill or energy from waste production through combined heat and power.



## FOOD & WATER

### Water treatment for developing countries

In its 2010-11 annual report, leading NGO WaterAid estimates 884 million people are living without safe water; 2.6 billion without sanitation. And 4,000 children die every day from the resulting diarrhoeal diseases. The products of chemistry help provide solutions suited to developing countries where on-site conversion of large quantities of dirty water into potable water is needed. In one such approach, a plastic housing contains filter membranes made from polyethersulfone which provide ultrafiltration and remove viruses as well as bacteria from dirty surface water obtained from rivers, lakes, rainwater collection barrels or puddles. Using the portable purification station drastically reduces the risk of contracting gastrointestinal illnesses from dirty water.

### Super powers!

Our industry is continually working on developing all manner of potential solutions to global issues, whether new processes and products, or new applications for existing products. Superabsorbents have been around for decades, but their application to halt and reverse the threat of desertification is more recent. By mixing into the soil around the roots of seedlings, for example, the volume and frequency of irrigation needed for crops and reforestation projects is greatly reduced. This could protect water resources in some of the driest parts of the world.

### Best practice tool

More focus is being devoted to improving industry's use of water supplies. At European level, Cefic is actively engaged through SusChem's partnership with the Water Supply and Sanitation Technology Platform. The integrated water management system put forward by the partners will include reuse, complementary water streams, and reduced consumption. Future materials and processes like renewable feedstocks and biotechnology which are water intensive will be addressed by the project.

### Wrap it up

According to the UN's Food and Agriculture Organization, a third of the world's food is lost in the supply chain or wasted. Europe accounts for around 18% of this loss. Plastic packaging can prevent a huge amount of food wastage from point of production to shelf: in Europe, packaging helps ensure spoilage during transportation affects just 3% of all products delivered to customers against up to 50% in developing countries. Plastic packaging extends the shelf life of fresh foodstuffs, saving 10% more than alternative materials, according to environmental consultant Denkstatt. Cutting food waste means feeding more people, it means less goes to landfill and less CO<sub>2</sub> emissions. Eliminating plastic packaging for food would cause GHG emissions to increase by a factor 2.7 or by 61 million tonnes/year, comparable to 21 million cars on the road.

Meat, for instance, benefits from an extended shelf life of five to ten days, or even longer using the most advanced plastic packaging solutions. Producing one kilo of beef leads to emissions equivalent to three hours of driving and requires 15,500 litres of water. Thanks to the prevented food loss, using a few grams of plastic packaging means saving at least 13 times the emissions caused during production of the packaging itself.



## MOBILITY & HOUSING

### Getting on with getting around...

Social mobility is an essential part of our modern lives. But with transport accounting for around 20% of all EU greenhouse gas emissions, and with ever-increasing fuel prices becoming a burden for both business and the individual, current practices are unsustainable. However, smart cars are getting smarter, thanks to chemistry. Working together, the chemical and automotive sectors have produced some truly futuristic products. One of the latest is an electrical concept vehicle that combines exceptional design with innovative technologies in the areas of energy efficiency, lightweight construction and temperature management. Transparent organic solar cells, transparent organic light-emitting diodes, all-plastic wheels, new lightweight body components and infrared-reflective films and coatings all lower energy consumption – and all made possible through chemistry.

### Building the future

EU statistics show that the building industry accounts for 40% of total European energy consumption and 30% of its CO<sub>2</sub> emissions, and that it consumes 50% of all extracted raw materials in Europe. The sector demands major efficiency improvements in order to achieve EU climate and energy targets for 2020. The chemical industry plays a vital role in helping reduce electricity consumption, improve insulation and ventilation, and in optimising overall energy efficiency in newbuilds as well as retrofits of existing buildings. The products of chemistry go into virtually every aspect of energy-efficient or even carbon neutral buildings: from solar panels for energy to double-glazed, airtight window frames; from environmentally friendly coatings and adhesives to low-energy lighting systems; from the high-strength plastic piping used to deliver geothermal energy to water filtration and recycling systems. For example, silicon used as a water repellent for concrete and bricks saves the heating energy used to dry external walls made wet by rain.

### Fuel-saving tyres

Tyre manufacturers seek to lower rolling resistance as a means of reducing a vehicle's fuel consumption and therefore CO<sub>2</sub> emissions. High performance silicas not only lower tyre rolling resistance but also improve tyre performance. Technology is enabling development of energy-efficient tyres with 25% less rolling resistance, offering savings of up to 5% on fuel consumption and CO<sub>2</sub> emissions without impacting performance.

### Cool operator

Over 70% of domestic emissions are a result of space and water heating in buildings. And energy is increasingly in demand for cooling. Smart application of a phase-change microcapsule technology, originally used in astronaut spacesuits, helps manage temperature fluctuations inside buildings. The basic principle is simple – wax droplets encapsulated in acrylic microcapsules absorb and release energy by melting and solidifying. When the interior temperature starts to climb just above the wax melting point, room heat is readily absorbed by the droplets incorporated into a building material. While the wax is absorbing the room's heat to melt, the room temperature stays constant, thus modulating temperature fluctuation. The system works in daily cycles so that at night, when the room temperature drops, heat energy stored in the microcapsules is released as the wax solidifies.



“It is my hope that the UN Environment Programme will be seen by you as a constructive, critical but above all committed partner to working together and making the use of chemicals something that we will retain as an option and opportunity, and also a right in the years to come, from the perspective of sustainable development.”

ACHIM STEINER, UNEP Executive Director, addressing the Cefic General Assembly in Madrid, September 2011

## THE FUTURE CHALLENGES & OPPORTUNITIES

# 6

This chapter looks at the future for Europe and its chemical industry, based on its vision to 2050. And although there are many uncertainties in attempting to look ahead over a single decade, much less several, we are in no doubt about some things.

Namely: sustainability is not an option, it's an absolute necessity. This does not apply only to the European chemical industry, of course, but to all businesses and society as a whole. The World Business Council for Sustainable Development estimates we'll need a 4 to 10-fold increase in global resource efficiency by 2050, with significant improvements required by 2020.

As well, future success depends on the European chemical industry's capacity to anticipate trends, to understand and meet our customers' needs; its capacity for innovation and society's acceptance of that innovation; and an enabling regulatory framework. More than ever before, success also depends on a new spirit of cooperation with governments, the value chain and society as a whole, based on a set of shared objectives and common values. Public-Private Partnerships of the Innovation Union initiative are an essential business structure for Europe's future.

## MOVING IN THE RIGHT DIRECTION

The EU 2020 strategy is certainly a step in the right direction with “flagship initiatives” such as Innovation Union, Resource Efficient Europe, Digital Agenda, Youth on the Move, and New Skills and Jobs flanking industrial policy. These initiatives are intended to orient European industry, its operations and products, to meet current and future demands of our society.

Horizon 2020 will focus funds on three key objectives. It will support the EU’s position as a world leader in science with a dedicated budget of €24.6 billion.

It will help secure industrial leadership in innovation with a budget of €17.9 billion. Finally, €31.7 billion will go towards addressing major concerns shared by all Europeans, across six key themes: Health, demographic change and well-being; Food security, sustainable agriculture, marine and maritime research and the bio-economy; Secure, clean and efficient energy; Smart, green and integrated transport; Climate action, resource efficiency and raw materials; and Inclusive, innovative and secure societies.

Our industry plays an important role in ensuring that our products and processes lead the way in meeting key EU targets for GHG emissions reductions, energy consumption and energy efficiency. We aim to meet or surpass those targets, particularly for R&D investment; and we can have a real influence on attaining employment targets, raising education standards, and helping alleviate poverty. Our industry will build on the well-established European Technology Platform for Sustainable Chemistry, SusChem, which boosts chemistry, biotechnology and chemical engineering research, development and innovation in Europe. It’s a successful example of industry collaboration with academia, and is backed by financial and consultative support from the European Commission. It will continue to provide new ideas and opportunities moving forward.

We are ready to take part in and lead EU Public-Private Projects such as water efficiency, smart cities and key enabling technologies. Our focus is on sustainable technologies that enable conservation of scarce resources and provide new routes and platform technologies such as coal-to-liquid, biotechnology and nanotechnology.

Our commitment to new sustainable chemical products and technologies will help instil public confidence in the industry, and stakeholder support for the partnerships necessary to achieve the Cefic Vision for 2050.

## Sustainable design

The Sustainable Design Guide has been developed by the UK knowledge transfer network, Chemistry Innovation KTN, and created in a partnership that includes the Royal Society of Chemistry, the Institution of Chemical Engineers and the Chemical Industry Association. This collection of materials illustrates established best practice in sustainable design and provides a practical approach to incorporating innovation strategies for product and services into companies’ business processes. The guide focuses on three key tools: Life cycle analysis, the Eco-innovation compass, and Technology road mapping. It is aimed at companies that are committed to putting the concept of sustainable design into practice for future products and services.

## GROWING SCARCITY OF RESOURCES

In a world of finite resources with a rapidly growing population, efficient use of natural resources and energy is increasingly crucial.

**Natural resources** are essential for the functioning of not only industry, but all societies and economies. We extract materials such as fossil fuels, metal ores and minerals; we use water, soil and land; and we harvest renewable materials and biomass. At the current rate of use, the world’s natural resource base is in danger of over-exploitation and eventual collapse, so there is no question that future consumption patterns must undergo radical change; business as usual is not an option.

At the same time, access to resources under fair conditions and at predictable and affordable prices is a major strategic economic issue for the European chemicals sector. Working in close partnership with all our stakeholders will help strike the right balance for a sustainable future.

It’s also essential to safeguard industry’s competitiveness under the EU’s overall policy approach. That competitiveness can clearly be enhanced through incentives for demonstrating innovation in areas such as renewable energy and GHG emission reductions.

**Energy** can represent up to 60% of manufacturing costs in the chemicals sector. We must build on partnerships and industry-wide initiatives and maintain individual company efforts that increase Europe’s competitiveness on the world stage. Previous chapters in this report describe some of industry’s efforts to decrease energy use by improving efficiency of its plants and processes, and its development of energy saving products. Our reliance on fossil fuels as raw material presents a huge challenge in terms of achieving further efficiency gains within current technical boundaries – that’s why support for research and development and innovation is essential to reach the next level of improvements.

**Water** availability and quality are under threat from global population growth, urbanization, pollution, desertification, overexploitation and climate change. Despite continuing improvement both as a result of regulation and better chemicals management through the value chain, Europe’s freshwater supplies remain under pressure from both the urban environment and agricultural practices. Pollution from industrial and household chemicals, metals, pharmaceutical products, nutrients, pesticides and fertilizers is being addressed through working with our partners in the value chain and other stakeholders to raise awareness and improve handling and use of chemical products.

On the other hand, industry supplies essential water treatment chemicals and technologies, and the means to deliver clean water through strong and reliable piping systems. Membrane technologies and special chemical treatments make contaminated water fit to drink. As well, industry makes products that reduce the need for water in agriculture, drought-resistant seeds and efficient fertilizers. And, as a major user, the chemical industry has made huge strides in its own water management, harvesting and reusing water based on methods that are responsible and sustainable.

## FURTHER INNOVATIONS

Chemistry and the chemical industry are among the most important enablers in addressing the future challenges of sustainable development, and in meeting the needs and expectations of society. We are fully engaged in addressing the issues and will continue to be involved in a range of different fields and activities.

Chemistry innovation will prove key in driving Europe's future competitiveness in a sustainable framework. It has a disproportionately positive impact on, and acts as a catalyst for, sustainable innovation in up- and downstream industries including consumer product sectors.

It also has an important role in achieving EU targets of Horizon 2020. Over the coming years and decades, chemistry will enable further innovative solutions in buildings, energy networks, transport and downstream industries, as well as in key areas like health, leisure and even education. The role of Public-Private Partnerships is key to transform ideas and concepts into reality – in smart cities, for example. In 2011, Cefic became an associated member of the Covenant of Mayors. This mainstream European movement involves local and regional authorities that are voluntarily committed to increasing energy efficiency and use of renewable energy sources in their urban areas. This move is particularly significant viewed in the context of EU figures stating that some 70% of European energy consumption occurs in cities.

To achieve true 'smart living' in the future requires joint public and private efforts to tackle the significant technical and societal issues we face in Europe.

Science's role in our towns and cities is clear. The construction industry increasingly looks to the chemical sector for solutions to the challenges of newbuilds and retrofitting or refurbishing of existing buildings. It requires products created through smart chemistry such as insulation, additives for building materials, adhesives, sealants, coatings and flooring.

Science also has an indispensable part to play in the agricultural sector where industry's core commitment is to play its part in providing healthy, affordable food for all.

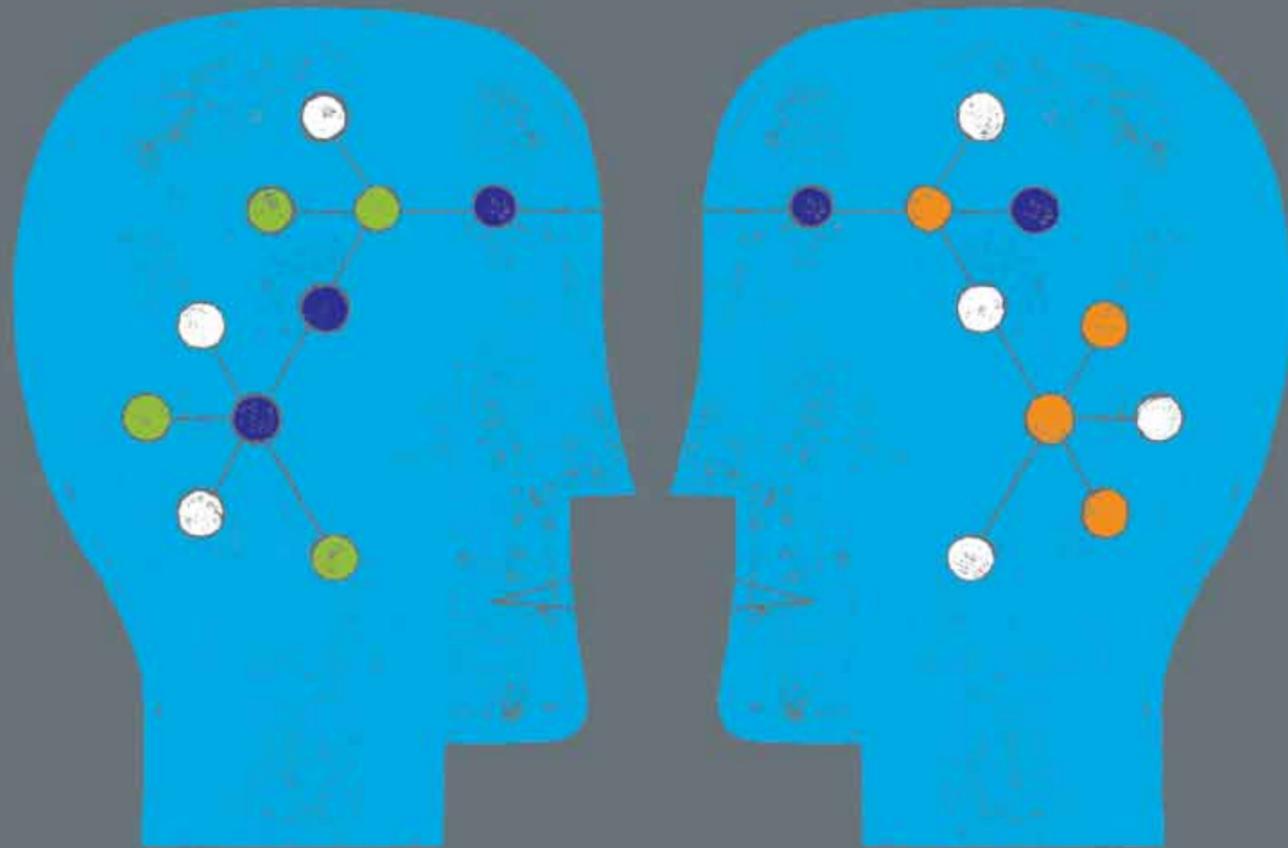
Crop science provides farmers with the tools they need to get the best harvest possible from the seeds they plant. About half of Europe's annual food crop harvest would be lost to disease without advanced crop protection; even with the best techniques about 30% of potential harvests is lost, so there is plenty of room for improvement. The pressures of world population growth, limited cropland availability, resource shortages and competition for land with biofuel and other non-food crops mean continual year-on-year productivity gains are essential to making our food supply secure.

## Embracing another triple P

As already noted, the current challenges cannot be tackled by one sector alone – Public-Private Partnerships, like the People, Planet and Profit of sustainable development, are another 'triple P' offering a business model for Europe to build out for a successful future. Integrated solutions for urban, industrial and agricultural environments will be based on reuse, recycling, waste water treatment, and recovery of raw materials that can be used for other processes and by other industries. The targets set by EU and national governments can only be met by employing innovative approaches led by multi-stakeholder groups pooling resources in terms of knowledge, expertise, finance and investment.

**This report aims to provide stakeholders with an overview of the European chemical industry's performance and current initiatives within the context of sustainable development. Cefic's Sustainability Strategy Group is currently identifying "flagship" initiatives that will mobilise the support of the chemical industry and its partners throughout Europe. We intend to provide the structures and conditions for our national associations and company members to increase and improve their contribution to the sustainability agenda. We are at the start of an exciting and very challenging journey.**





“For companies in the chemical sector it’s key to speak with challenging stakeholders, such as civil society groups concerned with effects toxics may have on health or the environment. It’s also key to engage with neighbours of chemical plants who may be concerned with the risk of emergency situations. Investors are increasingly looking for information on performance related to sustainability. The focus now needs to be on a more challenging assessment of how chemical companies can take responsibility and contribute to a sustainable economy, towards a better future.”

MAAIKE FLEUR, Senior Manager -  
Reporting Framework,  
Global Reporting Initiative (GRI)

## METHODOLOGY

Cefic’s first sustainability report is one step towards achieving the vision approved by the Board of Directors. It highlights actions undertaken by Cefic working with its membership, and in partnership with a diverse group of interested stakeholders.

Sustainable development has been identified as a strategic priority of Cefic. The Board has tasked a working group with development of a framework to take forward to the chemical industry in Europe. We are not starting with a blank sheet of paper – we are drawing on the expertise of many of our member companies and several federations that have embraced successful sustainability strategies and are reporting against the three pillars of planet, people and profit.

### Indicators aligned with GRI

Among Cefic’s corporate members, nearly all report under the Global Reporting Initiative (GRI) guidelines. The UK Chemical Industries Association began sustainability reporting in 2004. Belgian federation Essenscia issued comprehensive sustainable development reports in 2009 and 2011. And Feique in Spain published sustainability reports in 2007 and 2011.

Cefic's own set of KPIs is based on GRI and the Essenscia approach. This extract from the Essenscia report reflects the route being followed by Cefic:

"... Adapting to fit – Essenscia had to make certain adjustments to take sector specificities into account and present a report for the entire sector in all its diversity, bearing in mind that the GRI methodology was principally developed for use by corporate entities."

On this basis, Cefic selected the KPIs best suited to our association and supported by EU statistics. The indicators have been compiled from data supplied by Eurostat, EPER and E-PRTR. The Eurostat statistics currently provide indicators for the 27 Member States. We have also drawn on some internal supplementary data with particular relevance to chemical sector activities including the environmental KPIs, as well as safety at work, and transport and logistics. This has been provided under the industry's Responsible Care health, safety and environment performance initiative. As noted in the KPIs section, the statistics provided under the two reporting processes are not comparable because Responsible Care data covers chemical companies that are members of their national chemical association and actively participate in the initiative; as well, not every association participates fully in voluntary reporting.

## **EU-sourced**

The KPIs show how the European chemical industry is improving over time. The indicators addressing industry's contribution to environmental protection cover energy, emissions, water and waste. Others provide a reflection of social performance in terms of direct employment, labour costs and safety at work. And a third tranche, covering added value, trade surplus, gross operating surplus, investments, R&D spending and labour productivity, addresses economic performance and the contribution of Europe's chemical industry to the economy as a whole.

This report also intends to show, through examples drawn from companies, national associations and sector groups, how the European chemical industry is committed to providing innovative solutions to enable sustainable growth – its own, and that of society as a whole. We paint a positive picture of current efforts drawing from a collection of statistics and case studies from companies and sector groups. We are not attempting to hide the fact that industry still needs to do better, and Cefic will not relax its efforts to help industry further improve its environmental, health and safety, and chemicals management practices.

## **Stakeholders contribution**

This report and specifically this set of KPIs are a starting point for Cefic. Much work needs to be done on a regular basis to gather a more complete set of indicators that will provide an accurate picture of the long term performance of the EU chemicals industry. Together with our stakeholders, we plan to identify more indicators for inclusion in future reports. A number of stakeholders were consulted in the course of preparing this report, and their feedback and input has been of enormous help. Indeed, many of them are quoted, and are listed in the following pages. We thank them for their time and their engagement, and look forward to continuing this dialogue.



# ACKNOWLEDGEMENTS

## Stakeholders

Thanks go to the many stakeholders who were consulted during preparation of this report. They include:

- BEUC, The European Consumers Organisation
- BUSINESSEUROPE
- Birdlife International
- Dow Jones Sustainability Index (DJSI)
- Global Reporting Initiative (GRI)
- Greenpeace
- European Commissioner L. Andor, Employment, Social Affairs and Inclusion
- European Commissioner M. Geoghegan-Quinn, Research Innovation and Science
- European Commissioner J. Potočnik, Environment
- European Commissioner A. Tajani, Industry and Entrepreneurship
- European Environmental Bureau (EEB)
- European Mine, Chemical and Energy Workers' Federation (EMCEF)
- Friends of Europe
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- International Year of Chemistry Young Leaders Group
- Organization for Economic Co-operation and Development (OECD)
- Royal Society of Chemistry, UK
- United Nations Environment Programme (UNEP)
- Vigeo
- World Business Council for Sustainable Development (WBCSD)
- World Wildlife Fund (WWF)

## References

### Companies

Throughout this report we have used examples of individual companies' product and processes, and initiatives driven by groups of companies often working in partnerships.

Many have been recognised in recent years under the annual Cefic Responsible Care Awards scheme.

We thank all those involved.

### National associations

- BELGIUM: Essenscia
- BULGARIA: Bulgarian Chamber of the Chemical Industry (BBCI)
- FRANCE: Union des Industries Chimiques (UIC)
- GERMANY: Verband der Chemischen Industrie e.V. (VCI)
- ITALY: Federazione Nazionale dell'Industria Chimica (FEDERCHIMICA)
- NETHERLANDS: Vereniging van de Nederlandse Chemische Industrie (VNCI)
- POLAND: Polish Chamber of Chemical Industry (PIPC)
- SPAIN: Federacion Empresarial de la Industria Quimica Espanola (FEIQUE)
- UK: Chemical Industries Association (CIA)

### Industry sectors & affiliates

- Association of European Adhesives Manufacturers (FEICA)
- Centre Européen des Silicones (CES)
- Euro Chlor
- European Association of Chemical Distributors (FECC)
- European Council of the Paint, Printing Ink and Artists' Colours Industry (CEPE)
- European Crop Protection Association (ECPA)
- European Fertilizer Manufacturers Association (EFMA)
- European Solvents Industry Group (ESIG)
- International Association for Soaps, Detergents and Maintenance Products (A.I.S.E.)
- PlasticsEurope
- SusChem: the European Technology Platform for Sustainable Chemistry

### Other European associations

- European Chemical Transport Association (ECTA)
- European Plastic Pipes and Fittings Association (TEPPFA)
- European Wind Energy Association (EWEA)
- PVC4Pipes

### European Social Partners

- European Chemical Employers Group (ECEG)
- European Mine, Chemical and Energy Workers' Federation (EMCEF)

### European sources

- European Agency for Safety and Health at Work (EU-OSHA)
- European Commission
- European Environment Agency (EEA)
- European Pollutant Release and Transfer Register (E-PRTR)
- European Pollutant Emission Register (EPER)
- Eurostat

### International sources

- American Chemistry Council (ACC)
- Convention on Long-range Transboundary Air Pollution (CLRTAP)
- International Energy Agency (IEA)
- International Labour Organization (ILO)
- United Nations Food and Agriculture Organization (FAO)

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For more information on this report, contact: Jean-Claude Lahaut, Secretary General, Cefic, [jcl@cefic.be](mailto:jcl@cefic.be); or, on the Sustainability Strategy Group, William Garcia, Executive Director, Cefic, [wga@cefic.be](mailto:wga@cefic.be).



## So...

What might the future of Europe's chemical industry look like?

... Based on a **holistic, life cycle approach** with the whole **value chain working together to** optimise environmental and societal impacts of chemical products...

... with closed loop production plants maximizing **recycling opportunities**, and using someone else's **waste as fuel**...

... located on **integrated sites** that supply **waste heat** to **homes and businesses**...

... making use of **synthetic photosynthesis**, using **CO<sub>2</sub>** as a **resource**...

... and using processes based on cost-effective and sustainable **biofuel** ...

... giving us **carbon neutral** production plants, whenever possible encouraging **biodiversity** through the cultivation of **wildlife habitats**...

... as our industry makes an **active contribution** to its **local communities and society** as a whole through the business of turning **yesterday's "futuristic"** products into **tomorrow's essentials**, such as...

**paints** and coatings that **convert sunlight** into **energy**,

**low-energy hygiene** and **well-being products** such as cold temperature laundry detergents,

**modular multi-material systems** for **buildings** that 'know' when to **heat** or **cool**,

smart, high efficiency, low-energy **lighting**,

**non-polluting**, **resource efficient transport** powered by **renewables**,

'**smog-eating**' cement, **self-cleaning** and **super strength** construction materials, easy **assembly** and **dismantling** of prefabricated **composite modules**.

There are products and processes that have barely even been thought of yet, but will become a reality in the years to come as long as we continue to build on the incredible innovative strength of the European chemical sector.

**Chemistry – simply essential for a sustainable future**



Cefic aisbl  
Avenue E. Van Nieuwenhuysse 4  
B - 1160 Brussels  
Belgium  
Tel: +32 2 676 72 11  
Fax: +32 2 676 73 00  
mail@cefic.be  
www.cefic.org



Use your mobile device to scan  
the QR (Quick Response) code  
and learn more about Sustainability.

