Biodiversity and Ecosystem services

What are they all about?

cefic

Contents

This guide is the outcome of a study commissioned by Cefic, the European Chemical Industry Council, and conducted by ARCADIS.

Foreword

This guide aims to give chemical companies insight into key concepts around biodiversity and ecosystem services, as these topics gain importance in the societal debate.

By offering a manufacturing industry perspective, we want to contribute to an informed debate on the role different sectors and stakeholders can play on the road towards sustainable production and consumption.

We also want to trigger further reflection on how the concept of biodiversity and ecosystem services is being addressed in the policy sphere. Policy options should consider the complexity of these issues, and go beyond the current focus of taxing manufacturing industry in Europe. A broad debate is needed on how to accommodate 9 billion people living well on this planet in 2050.

Our industry's contribution to this challenge is outlined in our Sustainability Report. This guide is another step on that journey.

Hubert Mandery
Director General, Cefic

Why this guide?

This guide aims to help both large and small companies in the chemicals sector to get started in integrating biodiversity and ecosystem services (BES) in their strategy and daily operations.

Over the past decades, human activities have modified natural ecosystems more rapidly and extensively than ever before. Our societies and economies have benefited from what nature has to offer, but these gains have been achieved at the cost of diminishing biodiversity and degrading ecosystems.

Ecosystem degradation is relevant to business, because companies both impact and depend on ecosystems directly and indirectly. Therefore, the loss of biodiversity and ecosystem services – the resources and processes that are supplied by natural ecosystems – has important implications for the long-term, and in some cases short-term, viability of businesses.

Issues related to BES arise along the whole value chain from supply of raw materials to consumption of products and treatment of waste material. This guide addresses the European chemicals sector, focusing mainly on its manufacturing activities. These activities have an impact mostly on the surrounding biodiversity and ecosystems and are dependent on the local ecosystem services.

DRIVERS OF BIODIVERSITY LOSS

- Habitat loss caused by land use change, e.g. conversion for urban, industrial or agricultural development
- Climate change, which is affecting the distribution of species globally, as well as the resilience and stability of ecosystems
- Pollution of air, water and soils
- Over-exploitation, such as uncontrolled and excessive freshwater use by agriculture, industry and private households
- Invasive species, which can disturb native ecosystems and functions

There are many BES-related issues that companies should take into account in their risk management:

- Growing scarcity of water or other goods delivered by nature can lead to economic losses.
- Regulations impose increasingly stringent permit conditions for industry, for example on water discharges or noise emissions near protected areas, and may require companies to take mitigating or compensating measures.
- As public awareness on biodiversity grows, concerns about industry's impacts can create reputational risks.
- Financial institutions pay more and more attention to the way they and their clients deal with biodiversity and ecosystem services.[1]

As part of its Responsible Care® initiative, the global chemical industry is committed to continuous improvement of its environmental performance. Although biodiversity is not explicitly mentioned in the Responsible Care Global Charter, BES considerations are linked to the efforts made by companies under this initiative. A growing number of companies and industry associations are also introducing specific initiatives in this area.

1. See e.g. the Natural Capital Declaration signed by CEOs of banks, investment funds and insurance companies. www.naturalcapitaldeclaration.org
2. 1–4 : Millennium Ecosystem Assessment (2005), 5: The Cost of Policy Inaction (EC, 2008), 6: Gallai et al (2009), referenced in EU Biodiversity Strategy (2011), 7–9: SOER (EEA, 2010)

FACTS AND FIGURES ON BIODIVERSITY LOSS

Global biodiversity decline is extensively described in the Millennium Ecosystem Assessment (2005) and the Global Biodiversity Outlook 3 (Convention on Biological Diversity, 2010). At European level, good information sources include the SOER 2010 thematic assessment on biodiversity (European Environment Agency, 2010) and the Biodiversity Information System for Europe (BISE).

Some facts and figures:[2]

- Two-thirds of ecosystems have degraded during the past 50 years.
- Over the past few hundred years, humans have increased species extinction rates by as much as 1,000 times background rates that were typical over Earth's history.
- Extinction now threatens some 12% of bird species, 23% of mammals and 32% of amphibians.
- In the past few decades, 20% of known coral reefs have been destroyed and another 20% degraded.
- The cost of the cumulative loss of biodiversity is estimated at nearly 14 thousand billion euros by 2050 – equivalent to about 7% of the estimated global GDP that year.
- The continued decline in bees and other pollinators could have serious consequences for farmers and the agri-business sector. Insect pollination has an estimated economic value of 15 billion euros per year in the EU.
- More than 10,000 non-native species are now present in Europe, 10 - 15% of which are considered to have negative economic or ecological effects.
- More than 40% of sensitive terrestrial and freshwater ecosystem areas are still subject to atmospheric nitrogen deposition beyond their critical loads.
- 10% of European natural ecosystem areas are still subject to acid depositions beyond their critical loads.

BES – What are we talking about?

2

Biodiversity is a broad concept. It's not only about plants and animals, but also about healthy ecosystems and the services these ecosystems provide to society.

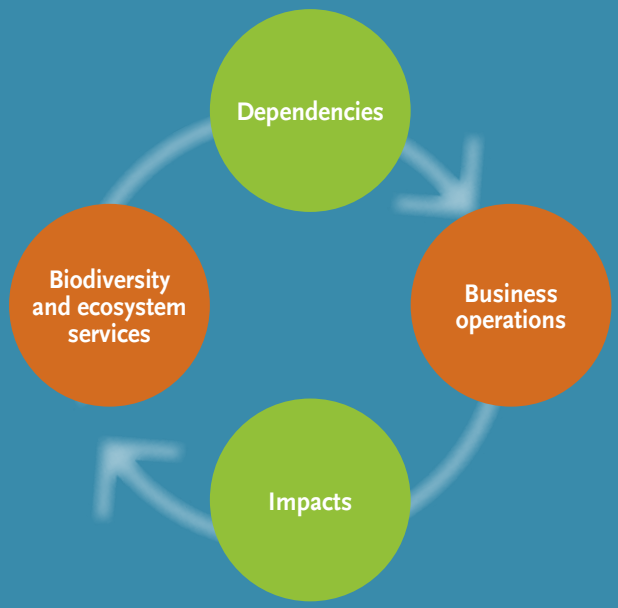
Environmental pressures are diverse and manifold, but in the end biodiversity and ecosystem services are always affected.

2.1 WHAT IS BES?

Throughout this guide, we use the terms biodiversity, ecosystems and ecosystem services, often abbreviated as **"BES"**. These terms are defined as follows:

- **Biodiversity** is short-hand for biological diversity. The UN Convention on Biological Diversity (1993) defines biodiversity as: "The variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and ecosystems."

BES IMPACTS AND DEPENDENCIES



- Biodiversity underpins the functioning of **ecosystems**. The Millennium Ecosystem Assessment (2005) identifies an ecosystem as "a dynamic complex of plant, animal and microorganism communities and the non-living environment interacting as a functional unit".

- Ecosystems provide a range of **ecosystem services** – the benefits people receive from ecosystems. Ecosystem services can be divided into four broad areas: provisioning services (e.g. freshwater, timber), regulating services (e.g. climate regulation, pollination), cultural services (e.g. recreation, spiritual values) and supporting services (e.g. nutrient cycling, soil formation).

So biodiversity is a much broader concept than the diversity of species and habitats, commonly referred to as "fauna and flora". This means that **biodiversity loss** has to be considered as either a **decline of species and habitats** or a **decline of ecosystems** (reduced area, degraded state).[3]

Human activities, including manufacturing activities, both have **impacts** on BES and **depend** on the services provided by healthy ecosystems.

3. The term "BES loss" would be more accurate, but this guide uses the well-known term "biodiversity loss".

2.2 WHAT FACTORS IMPACT BES?

Biodiversity and ecosystem services are affected by many pressures throughout the business value chain and at different scales. The impacts are often indirect.

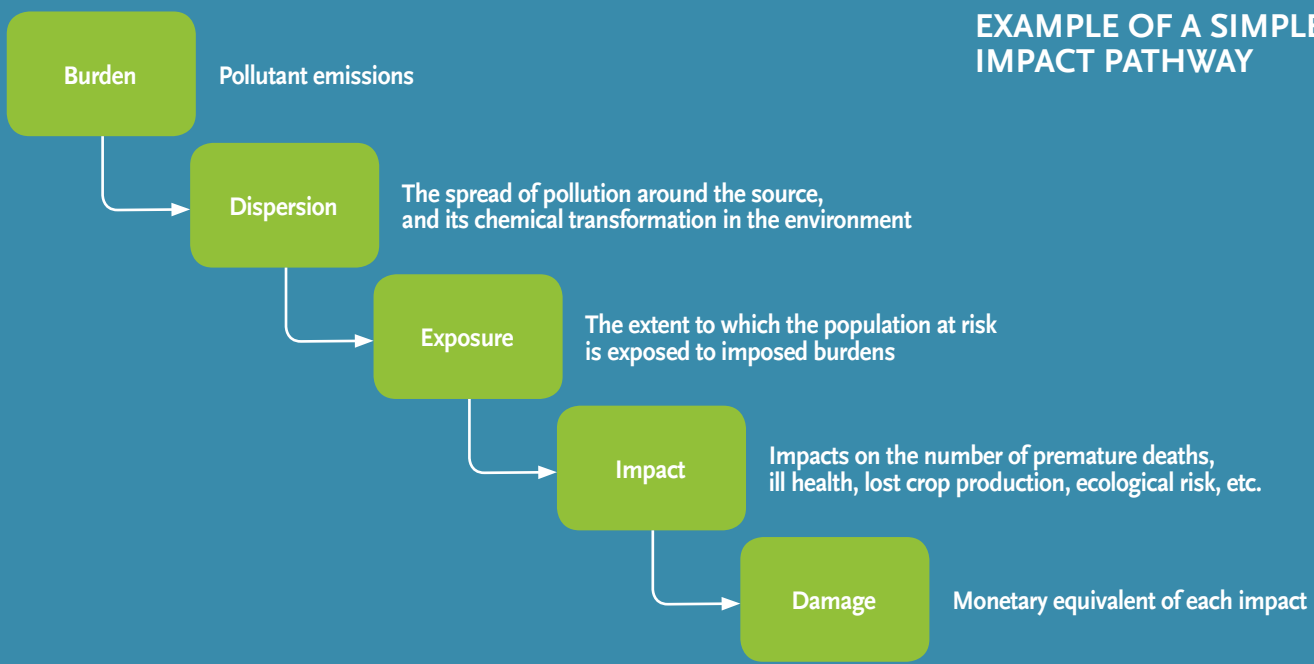
One way to estimate the significance of impacts on BES is the so-called **impact pathway approach**[4]. It follows a stepwise progression from pollutant emissions to determination of impacts and a quantification of economic damage in monetary terms.

Some pathways are simple and linear. For example, to quantify the effects of particulate matter emissions on human health, inhalation is the only relevant exposure route. Pathways for other pollutants may be significantly more complex. The same applies to impacts on biodiversity.

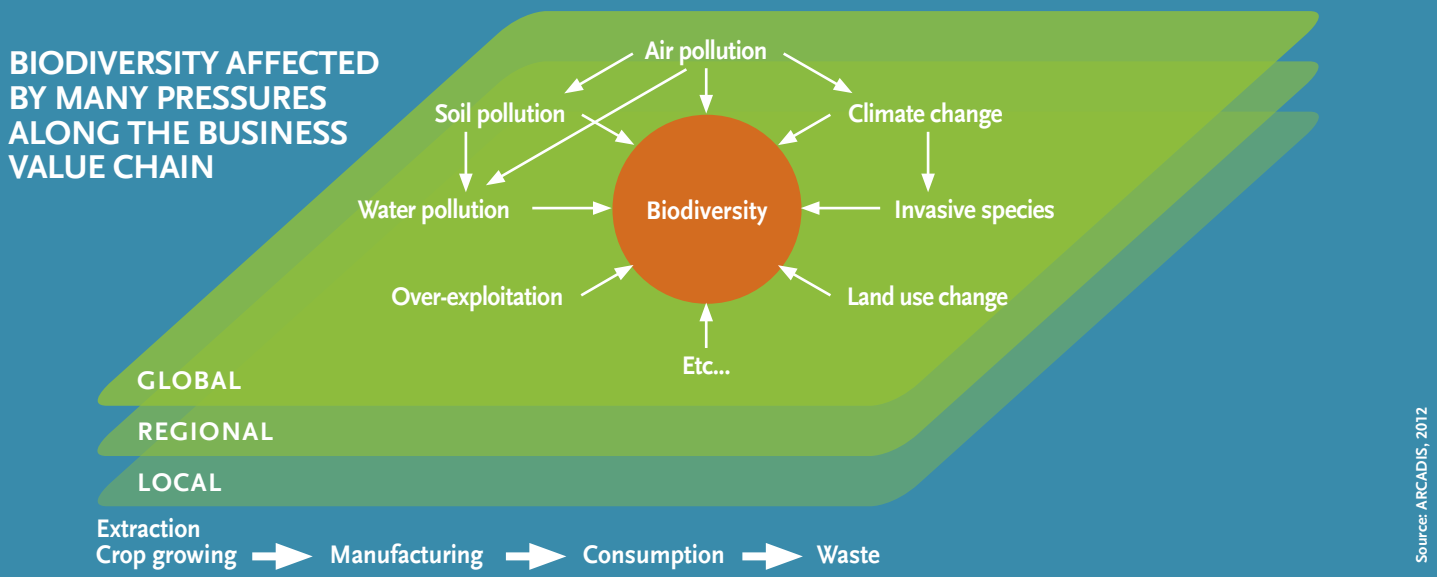
As impacts and dependencies are often site-specific, impact assessments should be carried out on a case-by-case basis.

4. This was originally developed in the 1990s in a collaborative programme, ExternE, between the European Commission and the US Department of Energy to quantify the damage costs imposed on society and the environment due to energy use. www.externe.info

EXAMPLE OF A SIMPLE IMPACT PATHWAY



Source: EEA, 2011



2.2.1 Drivers of BES impacts

- **Air pollution** affects biodiversity in different ways. Examples include "acid rain" caused by sulphur dioxide (SO_2) emissions, eutrophication of vegetation caused by excessive nitrogen emissions (NO_X, NH_X, etc.), and climate change caused by greenhouse gas emissions (CO_2, CH_4, etc.)

- **Water pollution** can be caused by excessive amounts of nutrients and phosphorus in surface water, leading to eutrophication. Other pollutants, such as hazardous substances, can lead to biodiversity decline, too.

- **Land use change** is a major source of biodiversity decline in the EU. Semi-natural agricultural areas and grasslands are declining and becoming increasingly fragmented. This makes them vulnerable to external pressures.

- **Soil pollution** can affect the microbial population in the soil and alter a whole range of ecosystem services – from nutrient cycling to the regulation of air, water quantity and quality.

- **Over-exploitation** of water resources, in particular groundwater, can cause desiccation effects in habitats which are groundwater-dependent. This is a typical local effect.

- **Invasive alien species** are non-native species posing a threat to biodiversity as they out-compete and displace native species.

- **Climate change** is expected to exacerbate the pressures on biodiversity caused by the drivers above.

2.2.2 Understanding impacts on BES

- Business activities can generate pressures that result in **immediate direct impacts** on BES. For example, land reclamation works to expand an industrial estate in a harbour area might cause serious direct pressures on the ecosystem (e.g. disturbance of aquatic fauna, disturbance of abiotic habitat conditions) and the services it provides (e.g. flood regulating capacity).

- These pressures can also result in **indirect impacts**. For example, greenhouse gas emissions contribute to climate change. Indirect impacts are often difficult to identify and assess, as cause-effect relationships related to BES are complex. Moreover, impacts are rarely one-to-one but often result from a number of cumulative processes over a longer time-span. Examples include the impacts of air pollution or climate change.

- Biodiversity and ecosystem services might be either **destroyed (complete loss)** or **degraded (quality decline)**. In some cases, BES might be **restored or created** if business activities are promoting BES conservation.

- Impacts on BES can be **local**, **regional** or **global**. Habitat loss due to the enlargement of a company's estate is typically a local impact. Water pollution might have regional consequences, while greenhouse gas emissions are considered of global importance. In the end, however, local impacts form a global issue.

- The significance of impacts depends on the **characteristics and magnitude of the pressures** (size, type, scale), the **state of the affected ecosystems** (ecological value, rarity) and their **resilience** to pressures (vulnerability, sensitivity). Therefore, BES impact assessments are very location-dependent. Significance can also be considered from a **compliance** point of view, but legislative compliance doesn't automatically mean that there is no impact on BES.

- Business activities should be considered along the **whole value chain** of products and services, using a **life cycle approach**. Links between business activities and biodiversity can be observed from the very early extraction phase of raw materials – even the exploration phase to find minerals or oil reserves – or the growing of crops and cattle, over the intermediary processing activities to the final production phase. Impacts also occur during the consumption phase and, finally, during the waste recycling or disposal phase. Between all these phases, transport can have impacts on biodiversity, too.

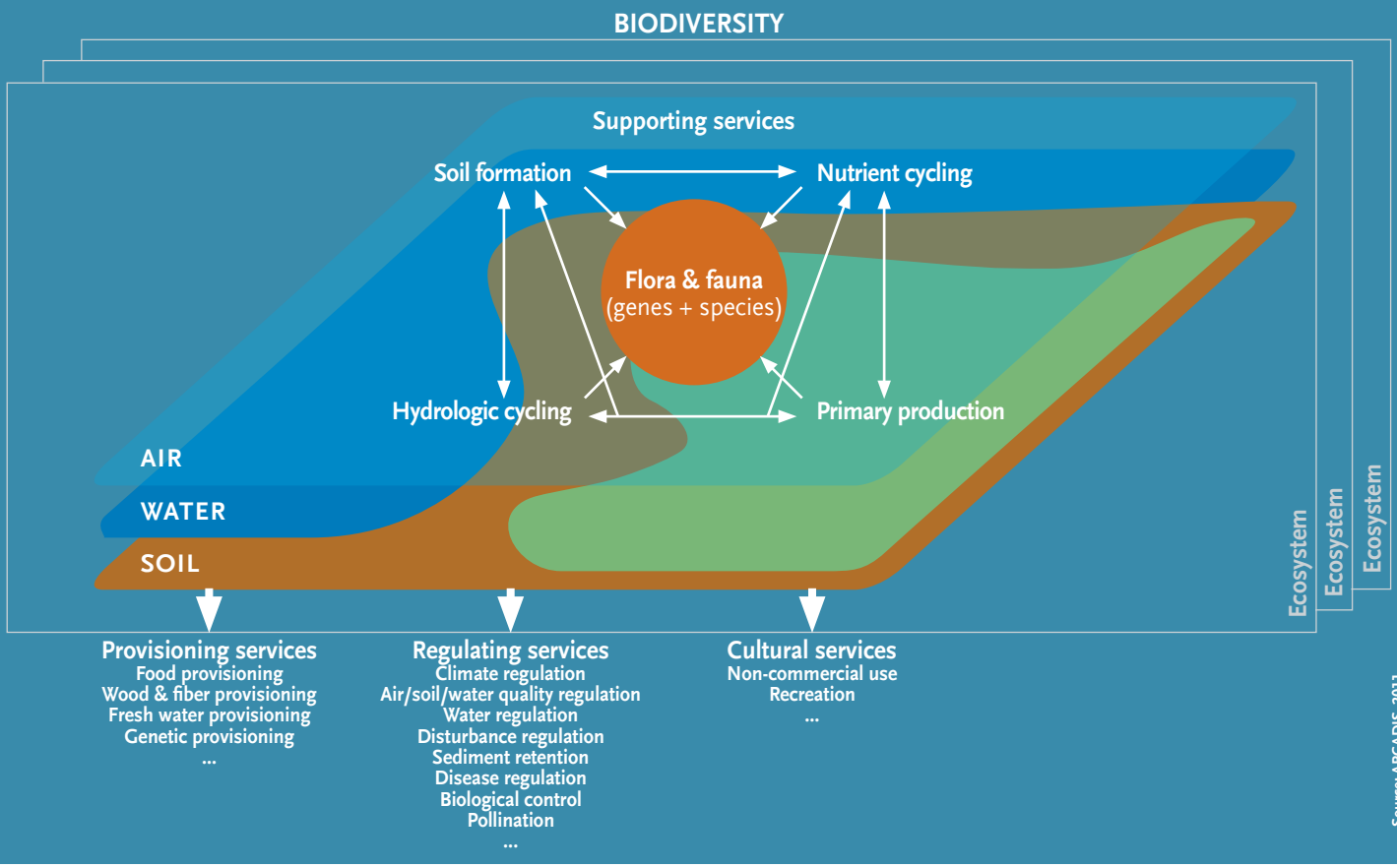
2.3 WHAT ARE BES DEPENDENCIES?

All types of ecosystems – such as rivers, wetlands, grasslands, or forests – provide a range of ecosystem services that also benefit humans.

For example, river systems provide freshwater, power, and recreation. Coastal wetlands filter wastewater, mitigate floods, and serve as nurseries for commercial fisheries. Forests supply timber and fibre, purify water, regulate climate, yield genetic resources, and so on.

All industries and companies depend on ecosystem services in many different ways. The availability of intact ecosystems and their services is therefore in the best interest of society, politics, science and business.

LINKS BETWEEN BIODIVERSITY IN STRICT SENSE (FAUNA AND FLORA), ECOSYSTEMS AND ECOSYSTEM SERVICES



Source: ARCADIS, 2011

Relevant legislation and other key concepts

3 BES policies and legislation are developing rapidly at all institutional and geographical levels.

BES issues are either mainstreamed in environmental legislation, for example in water legislation, or specifically addressed through policies and legislation such as the EU's Biodiversity Strategy or nature directives.

Public authorities and businesses are challenged to properly value and account for natural capital and ecosystem services.

Financing of BES restoration and conservation is becoming a major challenge. Innovative financing mechanisms, such as payments for ecosystem services, are on the agenda.

3.1 SETTING THE FRAMEWORK

In Europe, the legislative framework for biodiversity and ecosystem services is set by both international and EU legislation. EU Member States can introduce additional legislation at the national or local level.

At the global level, the **Convention on Biological Diversity** delivers the international framework for biodiversity legislation. The Convention is an international treaty set up in 1992 at the United Nations Conference on Environment and Development, or the so-called "Rio Earth Summit". It has three main objectives:

- The conservation of biological diversity,
- The sustainable use of the components of biological diversity,
- The fair and equitable sharing of the benefits arising out of the utilisation of genetic resources.

In the European Union, the **EU Biodiversity Strategy to 2020** sets a headline target for halting biodiversity loss in the EU by 2020. The headline target is complemented by more specific targets and actions, which aim to:

- Protect and restore biodiversity and associated ecosystem services,
- Enhance the positive contribution of agriculture and forestry and reduce key pressures on EU biodiversity, and
- Step up the EU's contribution to global biodiversity.

The European Commission seeks to involve businesses in this strategy. It has, for example, set up an **EU Business and Biodiversity Platform**.

The objectives of the Biodiversity Strategy are also taken over in the European Commission's **Roadmap to a Resource Efficient Europe**. It aims to set the vision and milestones for putting Europe on a path to resource efficient and sustainable growth.

Among these milestones, particularly relevant for the chemical industry are the EU's plans to ensure that, by 2020, "market and policy incentives that reward business investments in efficiency are in place" and "natural capital and ecosystem services will be properly valued and accounted for by public authorities and businesses". According to the Roadmap, "new policies should help to align the prices of resources that are not appropriately valued on the market, such as water, clean air, ecosystems, biodiversity, and marine resources".

In addition to the EU, various international organisations are developing initiatives around natural capital valuation and accounting.[5]

EU BIODIVERSITY VISION AND TARGET

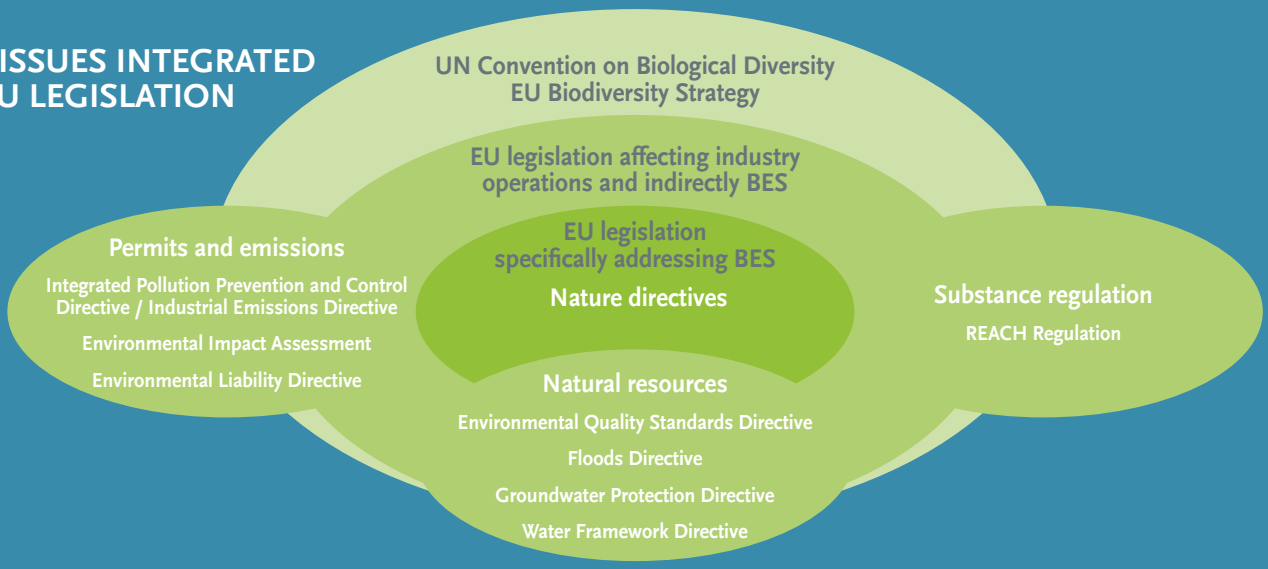
2050 vision

By 2050, European Union biodiversity and the ecosystem services it provides – its natural capital – are protected, valued and appropriately restored for biodiversity's intrinsic value and for their essential contribution to human wellbeing and economic prosperity, and so that catastrophic changes caused by the loss of biodiversity are avoided.

2020 headline target

Halting the loss of biodiversity and the degradation of ecosystem services in the EU by 2020, and restoring them in so far as feasible, while stepping up the EU contribution to averting global biodiversity loss.

5. See e.g. the WAVES partnership (www.wavespartnership.org) and the Natural Capital Declaration (www.naturalcapitaldeclaration.org)



3.2 BES INTEGRATED IN EU LEGISLATION

It is important to differentiate between EU legislation **specifically** addressing BES and EU legislation affecting industry operations and **indirectly** BES.

Key policy instruments specifically addressing BES are the EU's so-called nature directives, which aim at favourable conservation status for selected species and habitats. Biodiversity concerns are also integrated into policies targeting industry and other sectors to reduce their direct impacts as well as their diffuse pressures, such as fragmentation, acidification, eutrophication and pollution. In this way, they are indirectly addressing BES.

3.2.1 Nature directives

- Several EU directives address the protection of fauna and flora in the EU.[6] For example, the **Habitats Directive** states that an 'appropriate assessment' has to be prepared for each plan or project that is located in or nearby a **Natura 2000** site and that might have a significant impact on that protected site. Only if the project developer can argue that there won't be significant impacts on the protected site, consent for the project can be granted. Industrial sites can face restrictions on acceptable noise emissions (to reduce disturbance to birds), water emissions, or air emissions.

6. A good overview: http://europa.eu/legislation_summaries/environment/nature_and_biodiversity

3.2.2 Permits and emissions

- The **Integrated Pollution Prevention and Control Directive**, which will be replaced by the Industrial Emissions Directive as from 2014, aims to minimise pollution from various industrial sources throughout the EU.

- The **Environmental Impact Assessment Directive** regulates the environmental impact assessment of projects with potential harmful environmental impacts. Many chemical companies are familiar with the requirements of the Directive. Biodiversity impact assessment is often an important issue in these assessments.

- The **Environmental Liability Directive** aims to prevent and, when necessary, remedy environmental damage at acceptable costs to society. It is based on the 'polluter pays' principle.

3.2.3 Natural resources

- The **Water Framework Directive** aims to protect and enhance the quality of groundwater and surface waters in the EU.

- The **Environmental Quality Standards Directive** sets out standards aimed at limiting the concentration of certain chemical substances that pose a significant risk to water quality.

- The **Groundwater Protection Directive** aims to protect groundwater from pollution by controlling discharges and disposals of certain dangerous substances to groundwater.

- The **Floods Directive** deals with the assessment and management of flood risks.

3.2.4 Substance regulation

- The **REACH** chemicals regulation aims to improve the protection of human health and the environment from the risks that can be posed by chemicals. REACH does not include direct risk assessments for biodiversity, but it can be expected to indirectly reduce the negative effects of chemicals on biodiversity.[7]

7. More information on the assessment of chemical risks to biodiversity in the context of REACH: http://ec.europa.eu/environment/integration/research/newsalert/pdf/173na6.pdf

DEVELOPING AN INDUSTRIAL AREA OF THE FUTURE

An example on how industries can contribute to developing green infrastructure is the Dutch "Industrial area of the future" project within the Leaders for Nature initiative led by the International Union for Conservation of Nature (IUCN). Co-initiator ARCADIS and other companies, including DSM, will combine their expertise to better use the 'grey' infrastructure of offices and plants in industrial areas.

This will help increase the profitability of the industrial areas and strengthen the connection between the private sector and civil society. The industrial area will also function as a corridor between nature areas, so that plant and animal species can distribute over larger areas and have more chances to survive in a changing climate.

GREEN INFRASTRUCTURE WITHIN AN INDUSTRIAL ESTATE

Source: ARCADIS, 2012

3.3 EMERGING CONCEPTS

3.3.1 Green infrastructure

An interesting concept within the EU's Biodiversity Strategy is **green infrastructure**[8], which can be defined as a strategically planned and delivered network of high quality green spaces and other environmental features. Areas protected as Natura 2000 sites are at the core of green infrastructure.

Enhancing green infrastructure can help maintain or create landscape features that are valuable for biodiversity and contribute to the delivery of ecosystem services.

3.3.2 Valuation of ecosystem services

The EU's 2020 biodiversity target is underpinned by the recognition that, in addition to its intrinsic value, biodiversity and the services it provides have significant economic value that is seldom captured in markets. Because it escapes pricing and is not reflected in society's accounts, biodiversity often falls victim to competing claims on nature and its use.

Economic valuation of BES impacts and dependencies aims at assigning quantitative values to ecosystem services. It is becoming an increasingly important issue for businesses. The Commission-sponsored international project on The Economics of Ecosystems and Biodiversity (TEEB) recommends that the economic value of biodiversity be factored into decision-making and reflected in accounting and reporting systems.

Economic valuation can inform a number of business purposes, such as

- **Communicating the value of ecosystem services** and engaging with stakeholders and policymakers,
- **Comparing the costs and benefits of an investment** in ecosystem restoration or protection with traditional engineered infrastructure, and
- **Identifying possible revenue streams** from an ecosystem service.

8. More information on the EU strategy on green infrastructure: http://ec.europa.eu/environment/nature/ecosystems

Economic valuation of BES is very complex and requires input from environmental economists. Generally, a combination of **qualitative** and **quantitative (monetary)** valuation techniques is applied. Limiting the assessment to monetary indicators alone would run the risk of excluding important ecosystem benefits and costs. Incorporating some level of qualitative analysis ensures that even when key ecosystem services cannot be expressed in numerical or monetary terms, they are given some weight in the analysis.

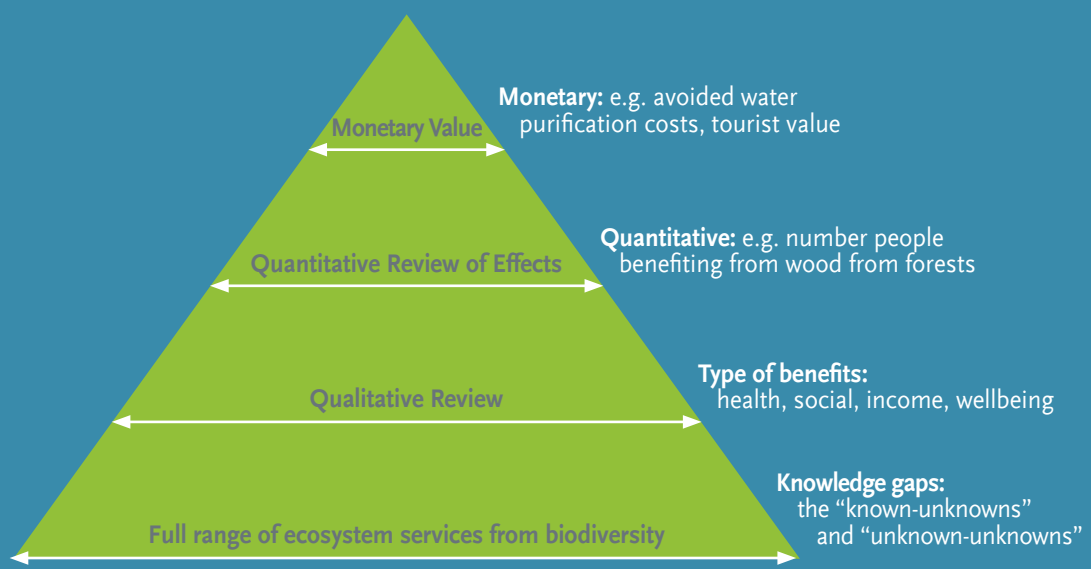
3.3.3 Mitigation hierarchy and "no net loss"

The mitigation hierarchy is a generally accepted and applied concept in environmental impact assessment. It includes the following steps:

- **Avoidance**: Measures taken to avoid creating impacts from the outset, such as careful spatial or temporal placement of elements of infrastructure, in order to completely avoid impacts on certain components of biodiversity.

- **Mitigation**: Measures taken to reduce the duration, intensity and/or extent of impacts (including direct, indirect and cumulative impacts, as appropriate) that cannot be completely avoided, as far as is practically feasible.

MONETARY AND NON-MONETARY ASSESSMENT OF ECOSYSTEM SERVICES



Source: Kettunen, Bassi, Gantioler & ten Brink : Assessing Socio-economic Benefits of Natura 2000 – a Toolkit for Practitioners. Institute for European Environmental policy, 2009

- **Rehabilitation/restoration**: Measures taken to rehabilitate degraded ecosystems or restore cleared ecosystems following exposure to impacts that cannot be completely avoided and/or minimised.

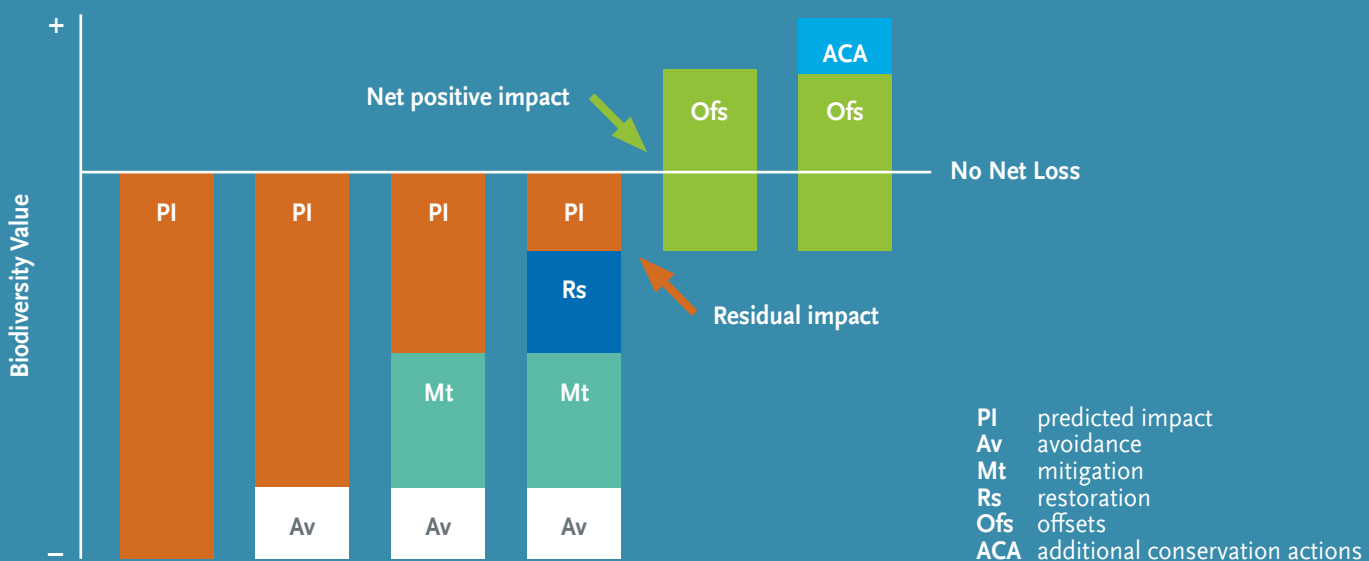
- **Biodiversity offsets**: Measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development after appropriate prevention and mitigation measures have been taken.

Using this approach enables an infrastructure development project to work towards **"no net loss"** of biodiversity, and ideally, a net gain. The application of the mitigation hierarchy, and how far each step should be pursued before turning to the next, is one of the key issues for consideration.

This concept is gaining support from the European Commission, which has started preparatory work to develop a regulatory framework on "No Net Loss" by 2015 as part of the EU Biodiversity Strategy.[9]

9. See e.g. the Commission's consultation on No Net Loss: http://ec.europa.eu/environment/consultations/wgnnl.htm

MITIGATION HIERARCHY



Source: Adapted from BBOP

Potential impacts and dependencies on BES in the chemicals sector

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As any other industrial sector, the chemical industry has impacts on BES. In general, these impacts are relatively limited in the manufacturing phase, but might be more important in other phases of the value chain. However, there are many opportunities to avoid, mitigate or offset adverse impacts on BES, and several companies have started to take action.

The chemical industry is also dependent on BES. Typical dependencies during the manufacturing phase are the provisioning of freshwater and protection against floods for sites located in flood-prone areas. In the other phases of the value chain dependencies can be much higher.

Chemical companies' activities and value chains are very diverse and often complex. This makes "typical" impacts and dependencies on BES hard to identify, but the examples below illustrate potential impacts and dependencies throughout a standard value chain.

Impacts also occur during transport between the different phases of the value chain.

4.1 SUPPLY CHAIN PHASE: WHAT COMES BEFORE THE MANUFACTURING PHASE

Impacts

1/ Habitat loss (land use change) during extraction or growing phase

For example, unsustainable management of plantations cause loss of tropical forests, and mining activities such as phosphorus mining can be very detrimental to local biodiversity.

2/ Disturbance during extraction or growing phase

Unsustainable mining and crop growing practices cause soil and water pollution and might disturb the hydrological balance. Other potential impacts include noise and light disturbance, dust emissions, traffic mortality, and fragmentation of habitats.

3/ Over-harvesting and over-exploitation

Excessive use of water can cause over-exploitation of water bodies.

Dependencies

1/ Provisioning of raw material (biological, mineral)

Chemical industries are highly dependent on the provisioning of raw materials from both renewable and non-renewable resources. The suppliers of these materials, in particular those active in renewable resources, are extremely dependent on provisioning services, such as water or wood.

2/ Genetic diversity

Although probably more important in the pharmaceutical industry, genetic diversity is also relevant for the chemical industry. It is essential to the development of new enzymes and micro-organisms, which are more and more applied by chemical companies active in industrial biotechnology.

3/ Pollination

Pollination is essential for at least one third of the world's crop production.

IN PRACTICE

Integrate BES issues in supply chain management: select and evaluate suppliers on standards for environmental protection. See BASF case study.

IN PRACTICE

Undertake risk analysis and risk management. For example, chemical companies active in agro-industry are developing initiatives to enhance honey bee and pollinator populations. See e.g. Operation Pollinator[10] (Syngenta).

10. Operation Pollinator is an international 5-year biodiversity programme to boost the number of pollinating insects on commercial farms, initiated by Syngenta and supported by partners such as universities, beekeeper and farmer associations, governmental bodies, NGOs and food producers. www.operationpollinator.com

IN PRACTICE

In the EU, new plants will be located in areas designated for these types of industrial activities. This spatial planning process is the responsibility of local and regional authorities. Spatial plans with potential impacts on biodiversity are subject to the Strategic Environmental Assessment (SEA) legislation. Using brownfields instead of greenfields for developing new industrial activities is considered a more sustainable approach.

IN PRACTICE

Conduct a BES risk analysis during location choice.

4.2 LOCATION PLANNING PHASE: PLANNING A LOCATION FOR A NEW FACILITY

Impacts

1/ Impact on protected area

About 18% of land in the EU is covered by protected sites under the Natura 2000 network, which co-exists and often overlaps with other nationally designated protected areas. Thus, the possibilities of interferences with this area when planning the location of a site are quite high and should be considered (e.g. locations near estuaries).

2/ Risk of direct habitat loss and/or fragmentation

Breaking a continuous habitat into a series of smaller fragmented patches can have substantial biodiversity impacts. Habitat fragmentation can be terrestrial (e.g. building roads or railways), aquatic (e.g. building a dam) or marine (e.g. building an offshore wind farm on an important bird migration route).

Dependencies

1/ Availability of natural resources

For example, freshwater is necessary for chemical processes.

2/ Safety against floods

Specific habitats and ecosystems can mitigate the effects of natural events, such as floods, which could affect the manufacturing installations.

4.3 BUILDING PHASE: NEW FACILITY, EXPANSION OR RENOVATION OF EXISTING FACILITY

Impacts

1/ Direct land intake (habitat loss)

Direct land intake refers to habitat removal or land conversion from the original land use (e.g. woodland, grassland, wetland) to an (artificial) land use. Permanent land intake can result for example from the construction of new roads, new industrial sites or housing, but also new agricultural areas (e.g. biofuels, palm oil). This leads to a permanent and often irreversible impact. Direct mortality of animals or plants may also occur for those species that live in the habitats that are removed.

2/ Fragmentation

See above.

3/ Disturbance

Even if building takes place in industrial estates, disturbances to the surrounding environment can arise due to noise, light, changes in hydrological regimes, air pollution by transport activities, etc. See also operating phase.

Dependencies

1/ Vulnerability of the location to flood risks

See planning phase.

IN PRACTICE

If building works might cause disturbance in adjacent protected areas (e.g. Natura 2000 areas in estuaries), prepare expert studies on biodiversity impacts and take appropriate measures to avoid or mitigate adverse impacts.

IN PRACTICE

Companies should implement state-of-the-art techniques to reduce emissions to air, water and soil. The chemical industry is already undertaking major efforts to reduce pollution and disturbance caused by its operations. Further action in all these areas will also benefit biodiversity.

There are many chemical industry examples of biodiversity conservation or restoration measures at site level. In Belgium, OmniChem (current Ajinomoto OmniChem) collaborated with the Flemish nature conservation NGO Natuurpunt to set up a winter refuge for bats. BOSS Paints, an SME, collaborated with Natuurpunt for the ecological restoration of a part of their plant area. At BASF Antwerp, sand stocks are left (temporarily) undisturbed to favour the nesting of Sand Martins, a swallow species. See also Dow Corning case.

4.4 MANUFACTURING PHASE: OPERATING A FACILITY

For the purposes of this guide, we assume a standard process requiring inputs (some of them to be provided by ecosystems, e.g. water) and generating emissions (e.g. wastewater, air emissions, noise emissions) in order to produce goods.

Impacts

1/ Air pollution

Local to regional impacts. Depending on the type of pollutants, impacts appear as eutrophication (N and P depositions), acidification (S deposition), "chemical pollution" (broad variety of chemical substances), fine dust (PM10, PM2,5). In particular, eutrophication and acidification are disturbing natural ecological processes and as such are major threats to biodiversity.[11]

2/ Greenhouse gas emissions

Regional to global impacts. Greenhouse gases (GHG) are the main cause of climate change, a major driver for biodiversity loss.

3/ Water pollution

Local and regional (rivers) to global impacts (chemical pollution in marine environment).

4/ Soil pollution

Direct impacts should be only accidental and cleaned up immediately. Indirect impacts, such as acidification and eutrophication, mainly occur through air pollution (contribution of chemical industry is rather limited).

5/ Over-harvesting and over-exploitation

Excessive use of water can cause over-exploitation of water bodies.

6/ Noise disturbance

Depending on location of the site, this impact can be relevant (e.g. site located nearby protected bird area).

7/ Light disturbance

Depending on location of the site, this impact can be relevant (e.g. site located nearby important foraging area for bats).

8/ Direct impacts on site level fauna and flora by either avoiding habitat development or enhancing it (biodiversity creation at site level)

Companies may want to prevent temporary habitat development on their sites to allow for the continuity of industrial operations. In some cases, biodiversity can be stimulated at the site level in the longer term.

11. The chemicals sector is not the major cause of eutrophication and acidification (see e.g. the European Pollutant Release and Transfer Register: http://prtr.ec.europa.eu)

Dependencies

1/ Air quality regulation by vegetation in neighbourhood
Industry might invest in forest conservation or afforestation to offset air emissions.

2/ Carbon sequestration e.g. by forests and peat lands
Industry might invest in ecosystem conservation and restoration to preserve carbon sequestration capacity (e.g. REDD+[12]).

3/ Provisioning of freshwater for process functioning, cooling, cleaning and transport
Delivery of water in the appropriate quantity and quality is closely linked to the presence of healthy, functioning ecosystems. Water scarcity is an important issue because it might affect companies' own operations and their supply chain. Extreme weather phenomena such as droughts, exacerbated by climate change, could for example affect freshwater availability and thus affect business operations.

4/ Vulnerability of the location to flood risks
See planning phase.

4.5 CONSUMPTION AND WASTE PHASES: WHAT COMES AFTER THE MANUFACTURING PHASE

Products, when consumed or discarded, can also have impacts and dependencies on BES. Multiple initiatives are being launched to minimise impacts in the use phase, such as products needing less water, eco-friendly packaging, or washing products performing equally at lower temperatures. In the waste phase, too, initiatives are emerging.

This guide does not focus on the use and waste phases, but more information on how companies can assess and develop their product portfolio using a life cycle approach can be found in the Cefic publication "Sustainability of products – What it's all about" (2012).

IN PRACTICE

Chemical companies can work with their downstream users and other stakeholders to help minimise the BES impacts of their products during the use and waste phases.

As an example, the European plastics industry has been instrumental in bringing together 47 plastics industry organisations from around the world to sign up to a "Joint Declaration for Solutions on Marine Litter", which outlines objectives for industry action and advocates close cooperation with stakeholders to reduce damage to the marine environment.[13]

Borealis and Dow are sponsoring a similar initiative. European Waste Free Oceans is an industry-led initiative (European Plastics Converters) aiming to reduce floating marine debris on Europe's coastlines by 2020. Using existing fishing trawls and new technology, EWFO will engage Europe's fishing community in cleaning up floating marine debris and bringing it back to land for recycling and sorting.[14]

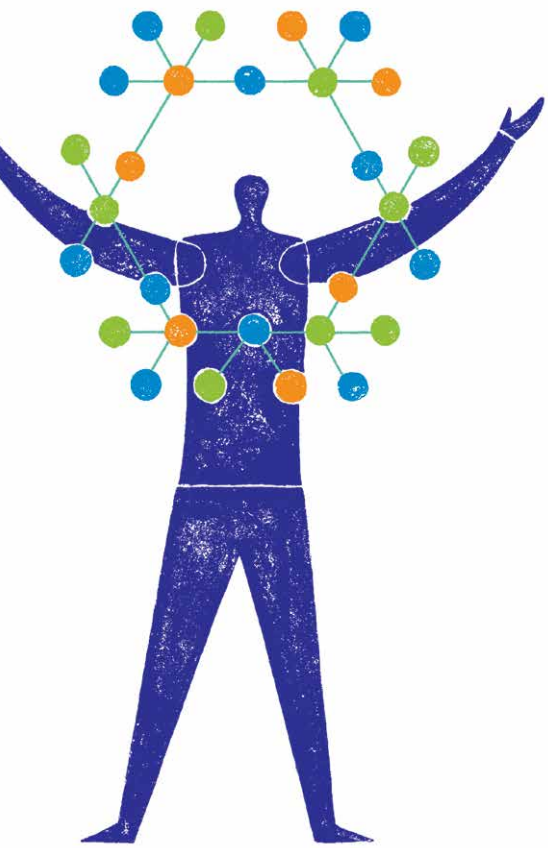
12. Reducing Emissions from Deforestation and Forest Degradation (REDD) is a United Nations effort to create a financial value for the carbon stored in forests. REDD+ goes beyond deforestation and forest degradation, and includes the role of conservation, sustainable management of forests and enhancement of forest carbon stocks. www.un-redd.org
13. www.plasticseurope.org/plastics-sustainability/marine-litter
14. www.wastefreeoceans.eu

BES risks and opportunities for the chemicals sector

5 Biodiversity is an upcoming challenge for businesses. Business risks and opportunities associated with biodiversity and ecosystem services are growing.

Risks are manifold: reduced or more costly access to natural resources, increased scrutiny by external stakeholders, unforeseen regulatory change and increasing regulatory burden on business, climate change altering the availability of ecosystem services, restricted access or increased costs of finance, and reduced market share and reputational damage.

So are the opportunities: increased operational efficiency, revenue opportunities from new products and services, competitive advantage through demonstrated positive impacts on BES.



Once the main impacts and dependencies on BES are identified, the associated risks and opportunities need to be identified and assessed.

It is likely that biodiversity-related risks will become more acute and more widespread across all sectors, as biodiversity rises up on the environmental and public policy agenda. The price tag of biodiversity loss is increasing also for the chemical industry.

At the same time, the industry's dependence and impact on BES can also create opportunities, depending on how companies deal with BES in their business operations, for example new product development, ensuring access to resources through strong stakeholder relations, and so on.

MAJOR TRENDS AND THEIR POTENTIAL IMPLICATIONS FOR BIODIVERSITY AND BUSINESS (based on TEEB for Business, 2012)

Trend	Business risk	Business opportunity	Chemical industry examples
Natural resource depletion Diminishing supplies of raw materials and biological resources, such as fresh water, fertile soils, timber, fish, etc. This trend is exacerbated by pollution, climate change, spread of invasive alien species, and rising levels of consumption in many emerging economies.	**Increasing scarcity of natural resources** implies reduced or more costly access, reduced output or productivity and disruptions of business operations. This creates growing uncertainty for companies dependent on natural resources.	**Resource efficiency** will become more important to business competitiveness. Increasing scarcity of natural resources and resulting price increases should stimulate investment in resource-conserving and substitute technologies.	In the Netherlands, Teijin Aramid is building a recycling facility and organising at a global level the collection of waste containing aramid fibres in order to develop a new recycled product, called Twaron Pulp 0701. Aramide fibres are used in fire-resistant clothing and car tyres. This also results in a 50% decrease of the CO_2 footprint.
Increased protected area coverage	**Continued expansion of protected areas** will restrict some business operations or increase operating costs for businesses relying on access to, or conversion of, land/marine areas.	Businesses able to **generate the same output from a smaller land or sea 'footprint'** will outperform their peers, where protected areas constrain access. A **track record of good environmental stewardship** and support for protected areas may be viewed favourably by regulators when considering business requests for access to resources.	The establishment of the Natura 2000 network in the EU has caused industries located in or nearby Natura 2000 sites to take extra measures to reduce biodiversity impacts. See e.g. Dow Terneuzen case.
Improved scientific information Ecological data are increasingly reliable, more easily accessible, and spatial data is of higher resolution.	**Advances in the monitoring of natural resources** will facilitate increased scrutiny by external stakeholders of business uses and impacts on BES.	Companies that use improved ecological information may gain advantage through **earlier acquisitions of high value resources, ecosystem service agreements and/or operating licences**.	

Trend	Business risk	Business opportunity	Chemical industry examples
Increasingly stringent environmental policy Public policies to protect nature and ensure that business pays for damage to biodiversity are increasingly stringent and enforced. Voluntary agreements or "soft laws" are also increasingly demanding and often anticipate future regulatory reforms, such as biodiversity offsets, eco-certification and labelling.	**Unforeseen regulatory change and increasing regulatory burden** on business to reduce adverse impacts on biodiversity, with governments applying the "polluter pays" principle more widely and stringently. **Compliance costs and "green" taxes** on carbon, water, land and other natural resources imply higher business costs. **More time and effort may be required for business expansion** (e.g. planning and permitting consents, credit conditions), as potential impacts on biodiversity are subjected to greater scrutiny.	Companies aware of their dependencies on BES are **prepared for permit processes** when expanding activities. Some companies go beyond compliance to prepare for impending regulatory change. Business may benefit by helping to **shape future regulations and improve stakeholder relations**. Increased reliance of policy-makers on market-based environmental policy, such as payments for ecosystem services, may **offer new revenue opportunities** for some businesses and/or **make the mitigation of impacts more flexible and less costly**.	The Dow Freeport site in Texas is investigating the potential for a large-scale tree planting project as a "green infrastructure" model to mitigate air pollution through existing credit trading programmes, and the ecosystem service benefits this would provide (e.g. carbon sequestration, potentially water quality improvements, recreational opportunities).
Climate change Complex phenomena attributed to greenhouse gas emissions are changing the functioning of ecosystems at regional and global levels.	Changing temperatures, increased extreme weather events, sea-level rise, increased water stress and drought will dramatically alter the **availability of ecosystem services** upon which all businesses rely.	Businesses can **integrate climate change impacts into long-term planning** and assess where this trend may jeopardise access to ecosystem services. Development of **business services and tools to evaluate risks** associated with climate change (e.g. climate risk mapping) or development of **climate adaptation services** (e.g. drought-resistant crops). Participation in emerging markets for **bio-carbon offsets** (including REDD+).	Syngenta conducted an Ecosystem Services Review focusing on one of its customer segments: farmers in southern India. By looking "downstream", the ESR helped the company identify risks its customers have been facing due to ecosystem degradation. In turn, opportunities are identified for Syngenta in the form of new products and services that would address or mitigate these risks.[15]

15. Case study on Syngenta's ESR: http://pdf.wri.org/esr_case_study_syngenta.pdf

Trend	Business risk	Business opportunity	Chemical industry examples
Rise of responsible finance Responsible investing is growing rapidly. Investment criteria increasingly include a range of environmental indicators. Corporate lenders are also tightening requirements for the provision of finance and increasingly considering the biodiversity impacts of prospective clients or projects. Recent revisions to the IFC Performance Standard 6 (covering the biodiversity impacts of project finance) will reinforce this trend.[16]	**Restricted access or increased costs of finance** for companies which have adverse impacts on BES, or cannot show that they are taking appropriate actions to avoid, mitigate or compensate for such impacts.	**Demonstrable positive impacts** on BES may be a source of competitive advantage.	A study by the Natural Value Initiative (NVI), KPMG and Robeco Asset Management analysed potential BES risks and opportunities for the pharmaceutical industry and evaluated ten companies using the Ecosystem Services Benchmark developed by the NVI.[17]
Changing consumer preferences Public awareness of biodiversity is growing rapidly[18]. Increasing awareness is likely to influence purchasing behaviour. Eco-labelling is moving from niche markets into the mainstream.	Risk of **reduced market share and reputational damage** if products are perceived to be harmful for biodiversity. Governments can influence consumer choice and producer behaviour by **market regulation and incentives** (e.g. taxes and subsidies), but also through their own purchasing strategies **(Green Public Procurement)**.	In particular for consumer-facing businesses, companies may wish to **ensure that biodiversity is fully embedded in risk management systems**. This also may include that they **influence key players in the supply chain** to ensure that biodiversity impacts are minimised.	Palm oil is nowadays the most consumed vegetable oil. It is not only used in the food sector but also in cosmetics and agro-fuels. This massive production of palm oil has impacts on tropical rainforests in South East Asia (direct land intake, water use, pesticides). As a result, the production of palm oil and products based on palm oil suffer from a bad reputation among many consumers. Different types of 'bio' labels lead to increasing market shares for palm oil free products.

16. IFC's Sustainability Framework: www.ifc.org/sustainability
17. More information: www.naturalvalueinitiative.org/content/010/105.php
18. Eurobarometer study: 'Attitudes of Europeans towards the issue of biodiversity' (March, 2010)

Tools to get started

6 A number of tools are available to identify and assess impacts and dependencies, as well as risks and opportunities.

Currently available guidance documents might not provide sufficiently detailed and practical support for many issues companies face. More development is needed on issues such as indicators, links with existing environmental management systems, and economic valuation.

It is clear that biodiversity and ecosystem services are becoming an important issue for the chemical industry. The question is how chemical companies can deal with it.

A large variety of international guidance documents exist and new documents are published almost monthly. Some are rather generic, while others focus on a particular aspect. This guide does not provide a detailed roadmap to develop and implement BES strategies in chemical companies, as this would require a more elaborated document.

6.1 SOME USEFUL TOOLS

In general, the development of a BES strategy requires the following steps:

- Assess **impacts and dependencies**
- Assess **risks and opportunities**
- **Prioritise key BES issues** with regard to main risks and opportunities
- Define **management** approach (how to deal with the key BES issues)
- **Monitor** these issues
- Define **reporting and communication** approach

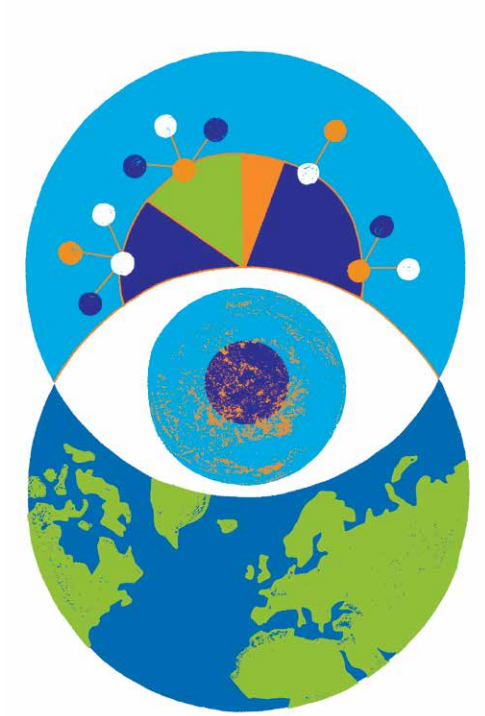
Some examples of potentially useful tools and methods to get this process started:

- The **Corporate Ecosystem Services Review (ESR)** offers a structured methodology to help businesses develop strategies for managing risks and opportunities arising from their dependence and impact on ecosystems.

- The **Corporate Biodiversity Management Handbook**, developed by the German Federal Ministry of Environment under the 'Biodiversity in Good Company' Initiative, shows what companies can do to support biodiversity in practice.

- The **Guide to Corporate Ecosystem Valuation (CEV)** helps companies better understand and capitalise upon the specific business value they receive from ecosystem services.

These guidance documents are useful to help set up the framework for developing strategies and actions on BES. Some actions on biodiversity can even be implemented without much guidance, such as creating nature at site level – natural ponds, green roofs, wild flowers, and so on.



6.2 GAPS IN CURRENTLY AVAILABLE TOOLS

Currently available guidance documents, however, remain rather superficial and don't provide practical support for many issues companies are facing when trying to implement a BES strategy.

Gaps remain in these areas:

- How to **define suitable indicators** to clarify the links between environmental pressures, such as air and water pollution, and BES impacts? This is an important issue in light of the upcoming debate on **"No Net Loss"**. The implementation of this concept might mean that companies will be expected to demonstrate that their activities are not causing a net loss of biodiversity and ecosystem services. Another important objective is the European Commission's target that "by 2020 natural capital and ecosystem services will be properly valued and accounted for by public authorities and businesses". These developments will require the development of suitable **BES metrics** to enable companies to measure and to communicate on BES losses and gains.

- How to **link BES assessment and monitoring** with **existing environmental monitoring and reporting practices** within companies, such as Life Cycle Assessment (LCA), environmental footprint, ISO 14001 standard, or the Global Reporting Initiative (GRI)?

- How should the **economic valuation** of changes in ecosystem services or use of ecosystem services concretely be carried out? At the institutional level, there is globally a trend towards applying the **"beneficiary pays"** principle next to the "polluter pays" principle. This leads to the development of so-called innovative or **new economic instruments**, such as payments for ecosystem services, markets for ecosystem services, and so on.

- How can the identified ecosystem services be **visualised**, using for example geographic information systems (GIS)?

Chemical companies should be aware of these shortcomings of available guidance documents. This is also the reason why leading companies within the sector have started initiatives to investigate how these gaps can be overcome.[19]

Trade associations can play a role by facilitating the exchange of information and experience, and further catalyse the development process. This guide intends to be the first step in that process.

19. See e.g. Dow's collaboration with The Nature Conservancy. www.dow.com/sustainability/change/nature_conserv.htm

Case studies

7

DOW CORNING
SITE LEVEL ACTIONS TO RESTORE OR PROTECT BIODIVERSITY

Dow Corning purchased the piece of land known as Cadoxton Ponds next to its site in Wales, UK, in 2000. The area is recognised locally and regionally as an important habitat.

Dow Corning decided to develop the area and give something back to the community. It established a partnership with the Glamorgan Anglers and the Wildlife Trust to develop the area as a fishing centre, nature reserve and education centre for employees and the local community.

The first phase of the project involved major excavation to extend the existing pond and dig a completely new pond to be used as fishing centre. In 2006, the Wildlife Trust assumed practical management of the nature reserve and developed a 5-year plan for the area.

Now the second 5-year plan has started. Based on updated survey information, the management of the area has encouraged new and nationally important species to the area. These include the Otter, which is protected at the European level, and the Bittern, which is one of the rarest birds in Britain, with only about 600 present in the UK every year.

DOW BENELUX
COHABITATION OF INDUSTRY AND NATURE ON THE TERNEUZEN SITE

Three examples of BES-related initiatives have been carried out at the Dow Benelux site in Terneuzen, Netherlands.

1. Flora & Fauna Inventory and Code of Conduct

In 2006, Dow developed an all-season Flora & Fauna inventory for its Terneuzen site after realising that a lack of awareness of protected species on the site can seriously delay project implementations.

A wide variety of species were identified on the site. An early conclusion was that the impact of industrial activity – other than the land use for the installations – was limited. Nevertheless, a code of conduct for responsible nature management was developed, approved by the Dutch Ministry of Environment, and implemented through a facility management contract.

The inventory was updated in 2011. It will be used to review and update the code of conduct every five years. It was also used as a basis for the site's Biodiversity Action Plan.

2. Habitat check

In 2007, Dow Terneuzen carried out a habitat check to investigate the potential negative impact of its activities and related emissions to the adjacent Westerschelde River, a Natura 2000 area.

Dow developed a "worst-case" analysis assuming that all emissions would finally end up in the river. On top of chemicals emissions, the analysis covered intake and discharge of cooling water, noise, and logistic movements on the river. For substances for which the possibility of a significant negative impact could not be eliminated, reduction efforts were defined – ranging from emission abatement to the development of alternative chemicals use.

In 2008, a Nature Conservation permit was received, laying down the required efforts to reduce the negative impact on the Westerschelde River.

3. Biodiversity Action Plan

In 2010, the United Nations' International Year of Biodiversity, the Terneuzen site took the initiative to develop a Biodiversity Action Plan as part of Dow's regional 2015 Sustainability Goals.

The plan included actions such as:

- Helping to raise awareness of biodiversity issues and contribute to stopping biodiversity loss at the local and regional level
- Undersigning a regional biodiversity covenant to gain insight into regional biodiversity issues and work together with other covenant partners
- Building relationships and working on biodiversity issues on a voluntary basis to contribute to a more positive image of the chemical industry

The initiative also helps the company to build experience and address internal hesitation resulting from fear of regulatory restrictions regarding its operations. Early involvement enables Dow to be prepared as biodiversity issues are increasingly integrated into legislation.

BASF
DIRECT AND INDIRECT ACTIONS RELATED TO BIODIVERSIY

Many chemical companies publish sustainability reports as part of their corporate reporting. Some of the targets set and actions taken in this context are closely related to BES, even though this might not be explicitly mentioned. The examples below are from BASF's sustainability report. Other chemical companies often do it similarly.

As companies are starting to increasingly consider BES issues, the benefits of specifically addressing BES can be expected to gain in importance – both for business and BES.

Supply chain management

BASF purchases raw materials from more than 6,000 suppliers. The company applies a sustainable procurement policy and undertakes environmental audits.

Link to BES: As most important impacts and dependencies on BES can be related to upfront phases in the value chain, supply chain management can be a powerful instrument to manage BES risks.

Reduction of air pollution

By 2020, BASF commits to reduce the volume (in tonnes) of air pollutants by 70% compared to 2002. Reductions of more than 60% have already been achieved.

Link to BES: Depending on type of emissions, air pollution leads to acidification and/ or eutrophication of terrestrial and aquatic habitats or contributes to climate change.

Climate protection

By 2020, BASF commits to reduce the volume (in tonnes) of greenhouse gas (GHG) emissions by 40% compared to 2002. BASF also develops so-called climate protection products. Compared to the alternatives, these products avoid GHG emissions over their entire life cycle in an eco-efficient way. Sales of these products are increasing.

Link to BES: Climate change is a major driver of ecosystem degradation. Any initiative that contributes to decreasing climate change benefits biodiversity.

Energy efficiency

By 2020, BASF commits to improve energy efficiency of their production processes by 35% compared to 2002.

Link to BES: Energy efficiency saves resources and reduces GHG emissions.

Renewable raw materials

BASF is involved in various projects along the value-adding chain to promote the sustainable cultivation of renewable raw materials, such as sustainable production of coconut oil and palm oil.

Link to BES: Cultivation of renewable raw materials might be detrimental for local ecosystems, if it happens in an unsustainable way. Ecolabeling, such as certification systems, is a way to demonstrate sustainable cultivation.

Water

By 2020, BASF aims to reduce use of drinking water in production processes by 50% compared to 2010, establish sustainable water management at all sites in areas of water stress, and reduce emissions to water of organic substances and nitrogen by 80% and of heavy metals by 60% compared to 2002. BASF has recooling plants at the larger sites to reduce the temperature of the cooling water before it is discharged back into a water body. BASF regularly monitors Rhine fish species diversity and abundance, and notices substantial improvements.

Link to BES: Water pollution and excessive use of water are disturbing aquatic ecosystems. All efforts to reduce pollution and reduce water abstraction contribute to preserving and restoring biodiversity.

Product stewardship

To preserve and foster biodiversity in agriculture, BASF participates in initiatives for the protection and conservation of ecosystems. In the UK, BASF has a test farm which aims to better harmonise economic success with biodiversity protection. In France, BASF works with partners in a network to promote bee health and biodiversity. BASF has also developed a specific methology, AgBalance, to assess sustainability in agriculture and the food chain.

Link to BES: Biodiversity impacts during the product phase can be very important. Product stewardship initiatives can help manufacturers achieve substantial benefits for biodiversity.

Source (except for 'Link to BES'): BASF Report 2011

TO DO LIST

☒ **Build awareness and commitment internally**
Involve all relevant departments in developing your BES strategy.

☒ **Build on existing efforts and information**
You don't have to start from scratch. Your company probably already collects data and undertakes activities that can contribute to your BES strategy.

☒ **Fill gaps in your environmental management systems** to make sure you cover BES issues.

☒ **Think global, act local**
While keeping the global picture in mind, confine assessments to site level, business lines or product lines in order to manage complexity.

☒ **Use existing tools**
Many tools and methodologies already exist to help companies address BES issues. Even though there are still gaps, these tools can help you get started in the process.

☒ Analyse BES pressures and dependencies

Assess the present and future risks affecting your company – operational, financial, or reputational – and potential ways to reduce or manage them.

☒ Consider the mitigation hierarchy

In managing your impacts on BES, follow this preference order: avoid, mitigate, rehabilitate/restore and, as the last option, offset.

☒ Identify opportunities

Proactively addressing BES issues can help you identify opportunities for making your operations more resource-efficient, developing new products or services, or building stronger relations with your stakeholders.

☒ Work with your value chain

The BES impacts of chemicals manufacturing are often less significant than those in other phases of the value chain. Work with your suppliers and customers to assess these impacts.

☒ Engage in stakeholder dialogue

Listen to stakeholders' concerns and use their knowledge as input for prioritising BES actions. Make your BES efforts visible and communicate about them.

References

United Nations and international initiatives

Global Biodiversity Outlook 3
Flagship publication of the Convention on Biological Diversity.
www.cbd.int/gbo3

Millennium Ecosystem Assessment
A United Nations initiative to assess the consequences of ecosystem change for human well-being and the scientific basis for action in this field.
www.millenniumassessment.org

UN Convention on Biological Diversity
International treaty for the conservation of biodiversity, the sustainable use of the components of biodiversity and the equitable sharing of the benefits derived from the use of genetic resources.
www.cbd.int

The Economics of Business and Biodiversity (TEEB)
International initiative to draw attention to the global economic benefits of biodiversity.
www.teebweb.org

Reducing Emissions from Deforestation and Forest Degradation (REDD)
United Nations collaborative initiative on Reducing Emissions from Deforestation and forest Degradation (REDD) in developing countries.
www.un-redd.org

EU initiatives

Biodiversity Information System for Europe (BISE)
Single entry point for data and information on biodiversity in the EU.
http://biodiversity.europa.eu

EU Biodiversity Strategy 2020
Aims to halt the loss of biodiversity and ecosystem services in the EU by 2020, and restore them in so far as feasible, while stepping up the EU contribution to averting global biodiversity loss.
http://ec.europa.eu/environment/nature/biodiversity/comm2006/2020.htm

The EU Business and Biodiversity Platform
Set up by the European Commission for businesses to share experiences and best practices.
http://ec.europa.eu/environment/biodiversity/business

Green Infrastructure
EU policies and activities around green infrastructure.
http://ec.europa.eu/environment/nature/ecosystems

Roadmap to a Resource Efficient Europe
Proposes ways to increase resource productivity and decouple economic growth from resource use and its environmental impact.
http://ec.europa.eu/environment/resource_efficiency/about/roadmap

SOER 2010 – Biodiversity
The European Environment Agency's The European environment – state and outlook 2010 (SOER 2010) includes 13 Europe-wide thematic assessments, one focusing on biodiversity.
www.eea.europa.eu/soer/europe/biodiversity

Multi-stakeholder and industry initiatives

'Biodiversity in Good Company' Initiative
Business initiative to advocate for the protection and sustainable use of biodiversity in partnership with other political and societal stakeholders.
www.business-and-biodiversity.de/en

Business and Biodiversity Offsets Programme (BBOP)
International collaboration to develop best practice in following the mitigation hierarchy to achieve no net loss or a net gain of biodiversity.
http://bbop.forest-trends.org

Corporate Biodiversity Management Handbook
A guide for practical implementation by the 'Biodiversity in Good Company' Initiative.
http://www.bmu.de/files/english/pdf/application/pdf/handbuch_biodiversitaetsmanagement_bf_en.pdf

Corporate Ecosystem Services Review
Structured methodology for corporate managers to proactively develop strategies for managing business risks and opportunities arising from their company's dependence and impact on ecosystems.
www.wri.org/project/ecosystem-services-review

Guide to Corporate Ecosystem Valuation
A framework for improving corporate decision-making through valuing ecosystem services developed by the World Business Council for Sustainable Development and other partners.
www.wbcsd.org/work-program/ecosystems/cev.aspx

Responsible Care®
The global chemical industry initiative to improve health, environmental performance, enhance security, and to communicate with stakeholders about products and processes.
www.cefic.org/Responsible-Care

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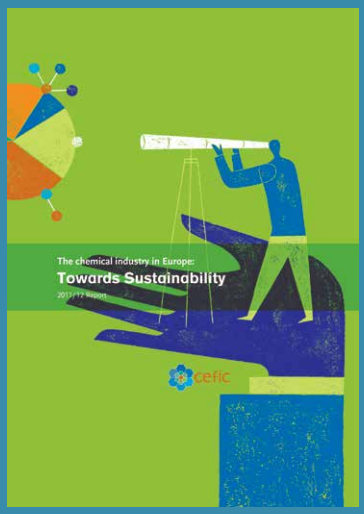

The chemical industry in Europe:
Towards Sustainability –
2011/12 Report

Sustainability of products –
What it's all about

Chemistry – simply essential for a sustainable future

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