

IMPULSE PAPER



Green Skills

There's a green collar worker in all of us

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Summary

One thing is certain: a company is only as sustainable as its employees. In addition to their management adopting a sustainability strategy that incorporates specific measures and measurable goals, the structuring of companies to be more environmentally sustainable also requires the cooperation of individual employees. Besides a deeper understanding of the need for sustainable economic activity, the prerequisites for this also include, (in part, new) skills and mainly, a high degree of willingness to act and change on the part of all employee groups at all levels.

This impulse paper will present the expertise and findings of the working group on Work, Education and Training, which we as its members have collected and discussed with experts from various disciplines, branches and institutions, practising or researching the topic of green skills. To start, we will demonstrate why the Plattform Industrie 4.0 working group saw a need to include this topic and the methodology and approach that was chosen.

As a preliminary step, an overarching definition of green skills is offered and notably, areas of action are identified that offer particularly great potential if employees continue to foster these. The areas of action identified will be presented in detail in the second part of this impulse paper and the respective significant focal issues outlined. Whether management, location, value creation, product or client, green skills are relevant in every one of these areas of action.

But what exactly are green skills? Along with an understanding and acceptance of the need for a sustainable mindset (the 'why') and expertise on green technologies (green knowledge, the 'what'), the transferable skills (the 'how') of all employees in every area of action are crucial. This triad is what lies behind our conception and understanding of green skills. In line with the familiar distinction between blue and white collar workers, green collar workers are our vision for the future.

A large number of German companies have already taken measures to achieve political and company-specific sustainability goals. Examples of good practice included in this paper illustrate how employees' green skills are brought into play within companies, in various areas of action and through specific projects and measures. The company-specific examples can serve as an incentive and demonstrate the versatile ways in which green skills find application in day-to-day operations through the undertaking of specific measures. Green key skills also function in line with education and training. For example, an article published by the Federal Institute for Vocational Education and Training describes how green skills work in accordance with the Vocational Training Act (*Berufsbildungsgesetz*) and the Crafts Code (*Handwerksordnung*).

A company's progression to sustainability is a long process during which continuous changes lead to permanent improvements. It is therefore necessary to keep posing the question: what can we make more sustainable and do better? Learning journeys constitute a training method that can be applied both in initial vocational training and further skills development. Learning journeys are structured routes through a series of coordinated tasks, which participants can complete independently, on a user-related basis and depending on their individual starting point. We have developed a learning journey that provides interested individuals with an initial introduction to the topic of sustainability in-house over twelve weeks. In participating, attendees embark on their own educational journey and can achieve their sustainability goal – individually or as part of a team.



Introduction

Background and imperative

Governments and society have recognised that climate change diminishes the availability of this planet's limited resources and that another approach towards managing them needs to be established. This insight has meant that sustainability has gradually evolved from a cost factor into a competitive advantage.

At national and European level, policymakers have been setting ambitious targets for several years. These include the UN implementation measures of the 2030 Agenda, alongside the 17 Sustainable Development Goals (SDGs) and the European Green Deal.

Simultaneously, a growing awareness of and demand for sustainable products and services is developing in society. This creates attractive new business models from which not only the environment, but also consumers and businesses can benefit. The sustainable extraction of raw materials and manufacture of other materials, their transport and processing, right up to recyclability and refeeding products back into the circular economy, are all becoming increasingly important. In addition to purely economic assessment criteria, evaluating these options and interrelationships in a way that makes sense requires further criteria for decision making, which are compiled via methods such as the life cycle assessment.

Yet it is not only the requirements for consumers that are changing, but also those for financial investors. For example, the proportion of sustainable and green forms of investment that financial institutions are offering their clients is steadily increasing. Alongside and as a result of their moral obligation, businesses are increasingly interested in designing and supplying attractive products for these clients and investors. The status of an Environmental, Social and Governance (ESG) investment enables companies access to capital that considers this sustainability criteria of relevance.

Thus, a large number of companies have now set their own sustainability targets. Consequently, whether products and services take account of these developments in society, whether the production process is largely resource-efficient, and whether a business is Climate Neutral Certified

will also play a role in the professional development of employees within companies. These developments lead to the evolution of a new awareness of sustainability in society, which must be reflected the corporate world.

Digitalisation can play a major part in economic activity that conserves resources. Many applications with sustainable objectives only realise their full potential through digital networking. Not least due to the pandemic, digital working methods were introduced into companies at rapid speed. These (can) offer benefits with regard to sustainability and have been accepted by employees. A host of working processes and behaviour that foster sustainability and are met with broad acceptance can now be found in everyday working life, such as:

- Avoiding and reducing business trips by working together online,
- Reducing paper printouts through digital storage,
- Avoiding long supply routes through local sourcing,
- Preventing waste in development through virtual prototypes,
- Replacing on-site maintenance with sensor technology and digital remote servicing.

To make a company more sustainable, it is not sufficient to have a sustainability strategy, rather it takes the understanding and commitment of all employees at all levels. Further to the knowledge and skills around sustainability taught in the dual vocational training system and at higher education institutions, there is a need for the development of additional green skills. Furthermore, existing skills must be transferred to new, sustainable contexts. This will put employees in a position to gradually make their company more sustainable. After all, only sustainable companies are fit for the future.

We believe that, in principle, employees are open to the topic of green skills. In order to harness this potential, it is imperative to make the interrelationships of resource-efficient economic activity clear in their causes and effects, to clearly explain the impact on the company environment,

and to demonstrate to employees the added value for themselves, the company and the prospects for the future of both.

An important building block here is the creation of environments that promote learning, and which enable skills development and continuous learning for all employees at any time. Policymakers and social partners are called on to develop solutions.

Methodology and definition of green skills

Green skills

By 'green skills' we mean a set of skills that enable employees to negotiate and take an active role in shaping the continuous and dynamic transformation of the working world when it comes to sustainability. In addition to concrete expertise, skills and knowledge, this also includes abilities such as understanding processes and transfer performance, as well as personal values, empathy and mindsets. The green skills triad of green knowledge, transferable skills and a sustainability mindset forms the basis for skilled employees in the green transformation of the economy. In bringing green skills to the entire workforce, the need for education and training extends to all employees with different focal points and intensities, depending on the sector, area of action and starting point. There is no "one size fits all".

Starting point and methodology of the working group

The authors of this publication are members of the Work, Education and Training Working Group of the Plattform Industrie 4.0. This working group brings together education officers from corporate management and works councils as well as representatives from trade unions and associations, whereby cooperation is characterised by close social partnerships. The focus of this publication has been placed on the industry's options and explicitly integrates the potential applications of digitalisation.

In multiple meetings with experts, the working group on green skills discussed the skills required of employees with regard to the transition to a sustainable, resource-efficient industry.

To illustrate the practical application of our green skills and meet the diverse starting points and needs of participants, we suggest a very agile and simultaneously generally applicable learning method, **learning journeys**. By way of example, a learning journey for the topic of sustainability has been included in this publication. This journey takes the respective individual contexts of participants into account, but can nevertheless be adapted to the individual company and its needs.

Explainer: learning journey



Learning journeys are structured routes through a series of coordinated tasks, which participants can work on independently and on their own initiative.¹

The learning journey provides stimuli, opportunities for reflection and tasks to take a closer look at the topic in-house.

1 https://unterrichten.zum.de/wiki/Lernpfad#cite_ref-1

Meetings with experts

For more in-depth training on the subject of green skills, the members of the working group invited experts from a wide range of disciplines and discussed the topic from their respective individual perspectives.

The meetings with the experts were conducted on the basis of the following three key questions:

- 1. In your opinion, which technologies will give sustainability a boost?**
- 2. How are the requirements of employees changing due to a stronger focus on sustainability?**
- 3. In your opinion, how will digitalisation support sustainability?**

The working group is very grateful to the following experts for their committed and inspiring dialogue:

- David Adams – Bitkom e.V., EU Public Affairs Policy Officer
- Dr Peter Post – Festo, Vice President, Corporate Technology Advisor and Academic Relations; Head of the Steering Committee of Plattform Industrie 4.0
- Sebastian Taugerbeck – the University of Siegen, Chair of Information Systems and New Media, ASUP – *Anwenderorientierte Smarte Umweltinformationssysteme in Praxis* (“Application-oriented smart environmental information systems in practice”); sustainKMU
- Patrick Hyscher – BSH Hausgeräte GmbH; BlueMovement Lead
- Dr Malte Busch – Fraunhofer-Institute for Systems and Innovation Research (ISI); Joint Innovation Hub
- Professor Dr Ing. Christoph Herrmann – Technische Universität Braunschweig, Chair of Sustainable Management and Life Cycle Engineering
- Lucas Bergmann – Busch-Jaeger Elektro GmbH; Sustainability and Infrastructure Manager
- Dr Monika Hackel – Federal Institute for Vocational Education and Training, Director-General for Structure and Regulation of VET



Green skills and their industrial applications

The discussions with the experts made it clear that there are several very important areas of action in industry in which green skills are of particular relevance and which offer great potential for improving sustainability, and thus also resource conservation. Even though we are of the opinion that there is particularly great potential to be found here, the many smaller areas of action and improvements cannot be disregarded.

The following section outlines the areas of action in which companies and employees in particular can and need to make improvements in industry. The following chapter lays out the green skills that, according to our findings, are currently of most relevance for these areas of action.

Areas of action

Safeguarding sustainability is a global challenge, where, in their multifaceted interdependencies, a plethora of rules and measures at various levels are difficult to determine and put into operation due to their diversity and complexity.

The focus of this impulse paper is therefore on the requirements that arise from the call for sustainability at company level. Emphasis is here placed on specific options that are at immediate operational disposal and can be realised with individual entrepreneurial responsibility. This also includes client relationships and partnerships in the context of value chains and material cycles. It is a matter of efficient, environmentally compatible and sustainable economic activity, and the development of innovative green technologies and solutions to ensure sustainability for the greentech sector.

This impulse paper describes five areas of action that mutually dovetail in their joint goals for sustainability, but take different forms in their operational contexts and the related tasks. The five areas of action are:

1. Management
2. Location
3. Value creation
4. Product
5. Client

An important aspect of this structuring involves the life cycle assessment (LCA), which analyses and assesses the relevant environmental impacts over the life cycle of products and services by measuring inputs and outputs of material flows. This results in various implications for individual areas of action. The decisive factors here are the impact assessments of in-house inputs and outputs, with a view to the prioritisation of measures. There are bigger adjustments through which comprehensive reductions in emissions are possible and smaller changes that facilitate sustainable optimisation. It is crucial that effectiveness and efficiency are in balance in an economic and ecological sense. It makes little sense to make a major financial investment in a measure if only marginal improvements can be achieved in the field of sustainability.

“Life cycle assessments mean that the environmental impacts of a product can be determined over its entire life cycle, i.e. from the extraction of raw materials, through production and consumption, right up to recycling. A life cycle assessment reveals the key areas of environmental impact and supports the process of improving a product from an environmental perspective and its environmentally friendly use. It can also be the basis for well-founded environmental claims made to clients, business partners and stakeholders.”²



Digitalisation opens up new room for manoeuvre in the innovative development and design of the big adjustments and small changes referred to above: in engineering in the context of sustainable energy, resource, material and process efficiency and their management using digital business models; in networking within the framework of digital ecosystems; and during the life cycle assessment itself.

To this end, the following description of the five areas of action gives specific suggestions and identifies important points (focal issues) with regard to rules, digitalisation and business models. The focal issues each set out the specific topics with which employees have to familiarise themselves in order to tackle challenges and press ahead with green issues.

Fig 1: Green Skills – Areas of action



Management:

- Drawing up the company's life cycle assessment
- Familiarity with statutory requirements & policy environments
- Defining sustainable business goals & facilitating implementation
- Anchoring sustainability as a core element in business models
- Making progress on the sustainability of products



Location:

- Reduction of carbon emissions by means of resource-efficient energy & water supply as well as sustainable energy & infrastructure
- Waste reduction & funding & implementing circular economy on site
- Consistent digitalisation in buildings for continuous emission monitoring



Value creation:

- Energy & resource-efficient production by pushing the progress of digitalisation in production
- Materials, design, process & procedural optimisation; use of recyclates
- Consistent promotion & implementation of circular economy in production



Product:

- Development of a product with a focus on a sustainable lifecycle
- Consideration of sustainability aspects during product design, in choice of raw & other materials, production method, transportation & durability or recyclability etc.
- Development of new design approaches through digital engineering & new manufacturing technologies



Client:

- Consistent communication for transparency & clarification of sustainability strategy to clients & partners
- Support & advice for clients & partners on sustainability aspects, with regard to the product or product environment, in order to improve their environmental impact
- Advice on or clarification of statutory requirements & regulations with regard to sustainability

Sustainable employees required at all levels! Define & anchor sustainability as a mindset!



Management

Sustainability and corporate environmental protection are integral components of corporate strategy and culture. Strategy and shaping corporate culture are key tasks for management.

This concerns the sustainability of products and solutions, and also sustainable policy environments for all the divisions of a company. The life cycle assessment in accordance with ISO 14040 provides a basis for determining and assessing a product's environmental impacts from the extraction of raw materials, through production and consumption, right up to disposal. The resulting measures can be derived in a targeted manner, the associated economic, ecological and social objectives combined in a holistic way, and the resources necessary for this included in planning.

In terms of corporate culture, implementation focuses on the involvement of employees in transparent processes of change and training, their skill and motivation in learning and applying new environmentally friendly technologies and processes that are relevant for the workplace, and in addressing sustainable developments with a learning approach. Further important aspects comprise dialogue-based communication on environmental issues related to company operations and green solutions, and the marketing of environmentally friendly products and services. The following focal points describe topics that are prerequisites for green skills, so it is necessary to become thoroughly familiar with them.

Focal points for rules:

- Environmental, Social and Governance criteria (ESG)
- Sustainable Development Goals (SDGs)
- Product Carbon Footprint (PCF)
- 2030 Vision for Industrie 4.0: Shaping Digital Ecosystems Globally
- Charter for Work and Learning in Industry 4.0
- Corporate Social Responsibility Reporting (CSR) from 2023
- Supply Chain Act from 2023/2024
- Etc.

Focal points for business models:

- Corporate, mechanical and product vision, mission and strategy for sustainability
- Sustainability management
- Sustainability monitoring
- Risk management
- Stakeholder communication
- Mindset – values with regard to sustainability
- Code of ethics
- Governance and compliance
- Closed-loop material cycle (CLMC)
- Etc.



Location

At company sites, with their buildings and respective infrastructure, it is of great significance to reduce carbon emissions by means of a resource-efficient energy and water supply that uses renewables and wastewater treatment options.

Ways to improve energy and resource efficiency in this area of action can be found in the building-specific and systems-related infrastructure – which is linked to operational value creation processes – and its integration into the regional supply networks.

Key topics are, for instance, the energy-focused designing of building envelopes, the designing of ventilation systems, process heat recovery and use, the reduction of energy consumption in the provision of process media, and

attractive load balancing of electrical power during processes and operating hours. The consistent digitalisation of building services engineering supports both the continuous monitoring of emissions and the steady application of energy and cost saving potential. A circular economy approach also leads to the reuse of valuable raw materials, to waste reduction and thus to cost reduction.

In addition to a site's design, the very decision for a location impacts resource efficiency. Alongside the traditional factors affecting the choice of location, aspects related to energy and resource efficiency, such as, for example, access to public transport for employees, but also ecological considerations and sustainability aspects, may have an influence on decision making, or work may be done towards their improvement.

Focal points for digitalisation:

- Smart sensors for collecting operational and metering data
- Digitally controlled energy systems
- Energy monitoring
- Smart grids
- Industrial Control Systems (ICS) Security
- Paperless processes by means of digital networking
- Digital workplaces
- Etc.

Focal points for business models:

- Integrated energy systems
- Energy efficiency networks
- Installation and utilisation of renewable sources of energy
- Communication concepts
- Working from home/mobile working
- Sharing models for electric cars/e-bikes; charging stations
- Mobility concepts
- Staff canteen with locally-sourced food
- Consistent digital workplaces
- Etc.



Value creation

Production that is energy and resource efficient can be achieved by implementing various measures. In addition to low friction and low loss organisational and production processes, these include traditional methods for making energy savings and procedural and logistical optimisation. The digitalisation of production in the context of Industrie 4.0 is an effective lever for managing measures more effi-

ciently, reducing emissions, improving material utilisation and decreasing the consumption of process media.

The consistent promotion and implementation of the circular economy in production also leads to the wider use of recyclates in the processing of materials, and thus to the reduced consumption of finite resources.

Focal points for digitalisation:

- Digital twins
- Virtual commissioning/optimisation
- AI-based evaluation and optimisation tools
- Product and process data management
- Smart sensors/gateways for collecting operational, performance and process data
- Horizontal/vertical communication
- 5G network
- Edge computing
- Industrial security
- Etc.

Focal points for business models:

- Manufacturing execution system (MES)
- Digitalisation of production (Industrie 4.0)
- Additive manufacturing processes
- AI-based intralogistics (AGV)
- OPC UA Retrofit
- Time-sensitive networking (TSN)
- In-house recycling as a service
- Etc.



Product

In the sense of sustainability-oriented product design, minimising a product's carbon footprint, its quality and durability, and its reparability, recyclability and reuse are central aspects. Right from its development, the focus is on a sustainable product lifecycle. Here, sustainability aspects are to be taken into account during product design: in the

choice of materials, technology and manufacturing processes.

An important target when designing products and solutions is their energy efficiency and positive effects on the client's volume of emissions in use and operation.

Focal points for digitalisation:

- Digital twins
- Simulation/test
- Virtual product and process design
- AI-based design and evaluation tools
- Embedded security (IT security)
- Adaptive manufacturing processes (3D printing)
- Etc.

Focal points for business models:

- Manufacturing execution system (MES)
- 3D-CAD-CAM
- Product lifecycle management (PLM)
- Design for manufacturability (DFM)
- Product development process (PDP)
- Digitalisation of functionalities
- Cyber-physical systems
- Networks – industrial internet of things (IIoT)
- Etc.



Clients

The recyclability of a product is determined during its development in the materials that are used, the processing method, the design and much more. Therefore, at the end of a product's lifecycle, the task is to recruit the client as a partner in order to support proper recycling. In this

respect, communication with clients will assume particular importance as, through support and advice, mutual added value be produced in ecological and financial calculations. Going forward, clients will become part of a circular economy.

Focal points for digitalisation:

- AI-supported process data/machine data analytics
- Cloud-connected sensors
- Mixed reality headsets
- Cyber security – secure identities
- Data platforms B2B/B2C
- Models of communication and dialogue
- Digital twins
- Simulation/optimisation
- Materials recycling
- Digital product passport (DPP)
- Etc.

Focal points for business models:

- Condition monitoring
- Remote services
- Predictive maintenance
- Second-life concepts
- Pay-per-part/pay-per-use
- Sharing concepts
- Models for renting/leasing
- Equipment-as-a-service
- Deposit systems
- Closed-loop material cycle (CLMC)
- Etc.

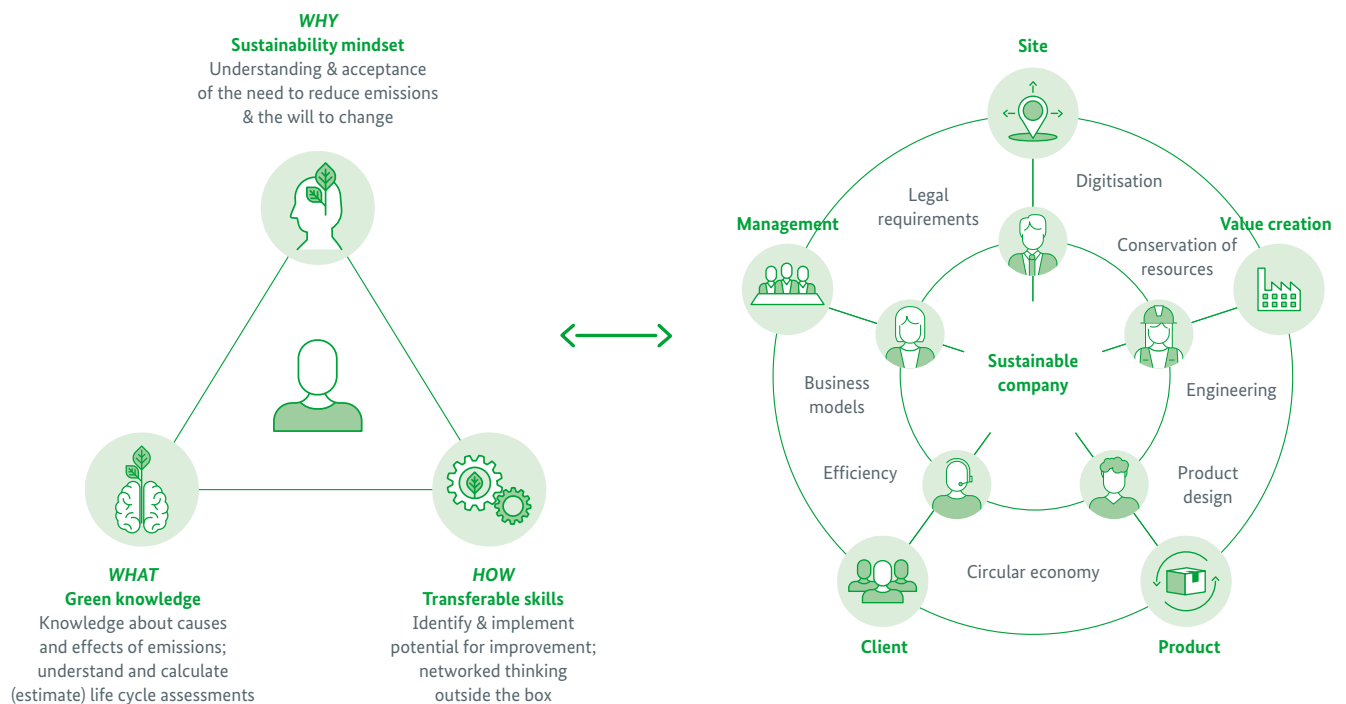
In their focal points, the areas of action described here illustrate that all areas of the business make their contribution to a sustainable industry and that these contribu-

tions also need to dovetail. This requires the knowledge and understanding of the respective upstream and downstream process steps.



There's a green collar worker in all of us!

Fig 2: Green skills are needed in all areas of the company



Source: Plattform Industrie 4.0

Green skills are of significance for all employees. It is not only green knowledge, but also the right mindset and the right transferable skills that form the foundation for a workforce that is expert in approaching sustainability.

Sustainability mindset

An essential insight from the meetings with experts was that selective engagement is not sufficient. The objective must not only be to achieve a certain degree of improvement, but to realise sustainability in the absolute sense: we need to reach our target of resource neutrality as a society. Industrial companies make a substantial contribution towards this target.

To achieve this ambitious goal, all employees right across the spectrum, be they executives, managers or personnel, need a fundamentally optimistic mindset that is focused on the significance of the self-effective shaping of a positive, sustainable future, and thus a future worth living.³

This will require diverse expertise and skills. Fundamental **critical thinking** and the **disruptive**, or at least **continuous, improvement** of existing processes and models is a basic prerequisite for a sustainable future. Coupled with **creativity** and a great **willingness to innovate**, this makes it possible to develop entirely new approaches and models. A great deal of motivation will also be required here to not lose sight of the goal.

3 Analysis: net-positivity – a new mindset for sustainability – Scholz & Friends Reputation (<https://nachhaltigkeitsberatung-sfr.de/en/>)

Diverse teams and the associated high level of **intercultural and interdisciplinary expertise** and **team skills** on the part of employees are an important catalyst in creating these innovations. Collaboration between employees with different expertise and skills creates synergies and new approaches to solving complex problems and achieving joint objectives.

An important aspect of this mindset is distinct orientation in terms of client expectations, product use and joint action to ensure recycling. In a demand-driven market, companies are given the opportunity to position themselves well with a high sustainability factor. At the same time, companies, and thus employees too, need a high **adaptive capacity** in order to be able to respond to disruptive developments with speed and flexibility.

Green knowledge

In addition to the right mindset, specific professional qualifications in a wide range of fields are a basic requirement for sustainable action within a company.

The top priority is a basic knowledge of **chemical, physical and energy-related interrelationships** in order to be able to recognise and categorise the causes and effects of the consumption of resources in the first place. A simple example is the knowledge that some manufacturing methods are perhaps more resource-efficient than others during production, but make recycling difficult at the end of a product's lifecycle. For instance, if a bolted joint that can be undone is replaced with a glue joint that cannot be removed.

Just as important is knowing how to **create and evaluate a life cycle assessment**. This is a complex process because drawing up a life cycle assessment requires the collation of data and information from a variety of processes and sources that are linked to a product or service. Depending on how system limits are defined, this can include:

- The origin of raw materials and semi-finished products, their transport and storage, and the consumption of resources in manufacturing
- Resource consumption during production
- Transport (e.g. to the client)
- Utilisation of the product by the client
- Product disposal, recycling rate

Further to the abovementioned knowledge and skills, there is an expanse of further knowledge from different domains to be pooled. Worth mentioning here is, for example, a fundamental **understanding of the law or knowledge of accounting and capital budgeting**.

Transferable skills

Transferable skills are those skills that are relevant and helpful in various fields. A wide set of such skills provide a solid foundation for successfully realising a complex way of looking at problems.

With regard to green technologies and sustainability, skills concerning **problem framing** and **analytical thinking**, for example, are very relevant here. The **development of innovative and creative solutions**, however, is also an important element. Here in particular, it is important to develop new approaches and ideas as alternatives to traditional and conservative business models and production processes. The application of design thinking and the creation of business models can be effective methods here.

The complexity of sustainability projects poses another major challenge. If, for example, a product's carbon footprint is to be improved, many areas and processes within a company are usually affected. Such a process of change that is cross-departmental and spans processes demands extremely complex **project, quality and operations management**, equally high levels of **communication and leadership skills**, and good **relationship building**, all in order to motivate every stakeholder to contribute, even over medium-term and long-term time frames.

A major lever in reducing carbon emissions is digitalisation. For instance, in simulating products or entire production processes, drivers of carbon emissions can be addressed in the development and planning phases, and alternative options explored. **Expertise and skills relating to digitalisation, IoT, edge computing, 3D printers** etc. deliver a competitive edge.

But on the other hand, it is also possible to facilitate more sustainable production by capturing and recording data digitally using the potential of statistics and data science. Therefore, a basic **understanding of statistics and data science** is a necessary precondition for many employees to be able to make valid decisions.

Fig. 3: A company's green skills



Sustainability mindset

Understanding & acceptance of the need to reduce emissions & the will to change

- Critical thinking
- Continuous improvement
- Creativity
- Willingness to innovate
- Client-focused
- Intercultural awareness
- Team skills
- Adaptive capacity



Green knowledge

Knowledge about causes and effects of emissions; understand and calculate (estimate) life cycle assessments)

- Ability to draw up & evaluate a life cycle assessment
- Awareness of chemical, physical & energy-related interrelationships
- Expertise on technologies for energy production & distribution
- Knowledge on the origin & composition of raw & other materials
- Construction, process & procedural knowledge
- Knowledge of the circular economy (end-of-life management)
- Legal understanding
- Finance



Transferable skills

Identify & implement potential for improvement; networked thinking outside the box

- Problem framing & analytical thinking
- Design thinking
- Project management
- Quality & operations management
- Digitalisation
- Statistics & data science
- Creating business models
- Communication
- Leadership
- Relationship building

Not new skills, but ones required in other contexts and from all employees across the entire company.



Practical examples

A large number of German companies have already taken measures to achieve political and company-specific sustainability goals. The following presents practical examples for the various areas of action mentioned. These company-specific examples can serve as an incentive and demonstrate the versatile ways in which green skills find application in day-to-day operations through the undertaking of specific measures.

Carbon footprints – “You can only manage what you can measure” – Bosch Climate Solutions GmbH



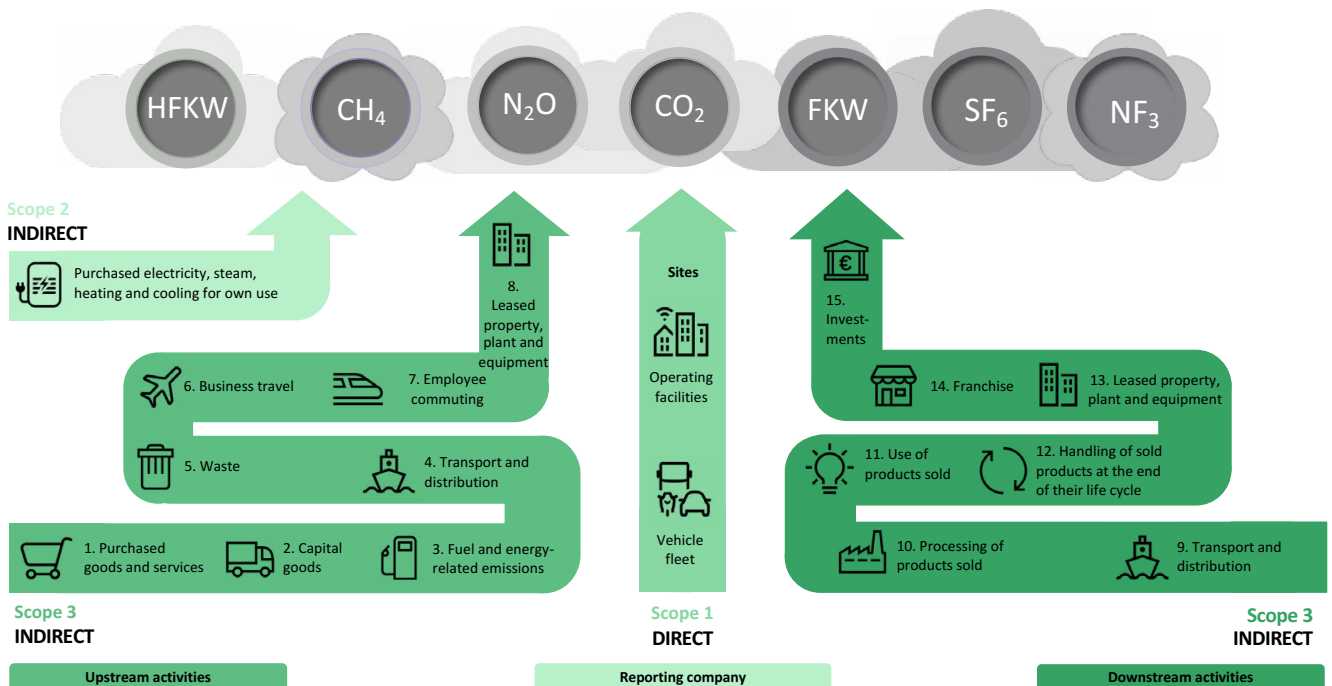
Area of action: management/value creation

Bosch Climate Solutions is a boutique consulting firm that was established as a spin-off two years ago with the idea to speed up climate action and sustainability in small and medium-sized enterprises (SMEs). Pragmatic solutions and collaboration on equal footing – by industry and for industry, is the motto. True transparency and reduction plans are of utmost importance to the team. Clients are

assisted at various points of their transformation process; very often projects begin with the calculation of their carbon footprint.

The old management saying, “You can only manage what you can measure,” also applies to the topic of emissions. Anyone who would like to reduce their emissions sustain-

Fig. 4: On the way to climate neutrality – Scope 1, 2 & 3 categories according to GHG Protocol



ably and in the long term has to establish transparency as a company as the first step. This transparency is achieved by calculating the carbon footprint in a way that is Greenhouse Gas (GHG) Protocol compliant. The GHG Protocol not least defines which emissions are attributed to the company itself (Scope 1 and 2) and which are generated in the upstream and downstream supply chain (Scope 3), all of which need to be factored into the calculation.

It also specifies what types of emissions need to be recorded. In addition to carbon dioxide, these also include methane and nitrous oxide. In most cases, the emissions are converted into CO₂ equivalents so that they can then be compared with one another. When it comes to recording emissions, various official standards for sustainability

reporting, such as the Global Reporting Initiative (GRI), are based on the guidelines of the GHG Protocol. A company can thus determine its carbon emissions through its climate footprint. This is primarily where a company's energy data is compiled, validated and linked to the right emission factors. In an SME, this usually feasible with manageable effort. In larger companies with many production sites and numerous offices worldwide, this can certainly require greater effort.

The company Hansgrohe SE, for instance, calculated its carbon emissions in line with the GHG Protocol and defined its activities for reducing it on the basis of this footprint.

Fig. 5: CO₂ footprint according to the GHG Protocol – example of the Hansgrohe Group

in tonnes of CO ₂			
	2018	2019	2020
Direct emissions (Scope 1)			
Emissions from Hansgrohe Group locations	4,301	6,600.00	5,176.30
Emissions from vehicle fleet	350	2,895.60	1,978.30
Indirect emissions (Scope 2)			
Purchase of electricity/heat by Hansgrohe Group locations	30,855	33,608.20	38,161.40
Total emissions (CO₂)	35,506	43,103.80	45,316.00

Source: Bosch Climate Solutions GmbH | Lisa-Alexandra Reehten | 01.10.2022

Proceeding from this, the focus was on company measures (Scope 1 and 2), in particular those on the topics of energy efficiency, the use of green electricity and in-house generation. The company is now working on logging and accounting Scope 3 activities in order to bring it closer to its goal of climate neutrality. All Hansgrohe SE locations, including production sites, subsidiaries and sales offices, are to be carbon neutral by 2022. The project entitled

Green Company focuses on every activity in order to collate numerous individual projects to form a greater whole.

This is a good example of a transparent and structured approach to the topic of sustainability, and specifically climate action, within a company. It is important that every small step counts – every company can make a contribution; you only have to start!^{4 5 6}

4 <https://www.hansgrohe-group.com/en/about-us/sustainability>

5 <https://www.bosch-climate-solutions.com/en/>

6 <https://ghgprotocol.org/>

“Climate neutrality in three steps” – ifm-Unternehmensgruppe Stiftung & Co. KG



Area of action: management

The ifm group of companies develops, produces and sells sensors, controllers and systems for industrial automation. Besides position sensors and process sensors, their product range includes sensors for motion control and safety technology. The ifm group wants to be climate neutral in its business operations by 2030. The basis for this is a climate strategy – ifm is following the three-step approach: avoid, reduce, offset. The first milestones have already been recorded. All their locations in Germany and all their European production sites purchase a supply of 100% green electricity. Moreover, 55% of their net greenhouse gas emissions at German locations are to be reduced to zero by 2025. A managing director for technology has been especially appointed and is responsible, as an extra role, for every aspect of the overall issue of sustainability.

ifm also has a special feature: since 2019 it has had a Social Sustainability Manager. This role is categorised as ifm Sustainability Management and adds an HR and organisational perspective. In addition to the ecological, the focus here is also on the social and economic aspects of sustainability. This involves close collaboration with colleagues in Environmental Management. For instance, the sustainability report is jointly produced by both departments. For ifm, it is clear that in keeping with the three pillars of corporate sustainability, the environment, the economic and social responsibility must be balanced and considered in an overarching context. To meet this requirement and be equipped in terms of content, structure and communication, the sustainability manager has completed training to become a HRMgreen Manager. It is with this expertise that an intensive dialogue on the entire subject matter ensues, in both a strategic as well as an operative vein. Theoretically, even subdivisions of the company

can be audited. Furthermore, social sustainability is both anchored in the HR strategy and is the subject of various organisational projects.

An example of transferring the sustainability strategy into practice in HR work is its being part of job interviews. It is thus clear to all participants from the very start that you sometimes have to go the extra mile to find the right solution when working to achieve sustainability goals.



Source: HRMgreen GmbH

Certificate of an HR manager with HRMGreen training

“Initiatives for reaching climate neutrality by 2030” – ABB AG



Area of action: location

Carbon neutrality by 2030 – ABB’s stated aim, which is anchored in the corporation’s sustainability strategy. Sustainability is at the core of the object of the company. ABB thereby strives to create sustainable value added for its stakeholders along the entire value chain. This aspiration is also anchored in the targets for top executives.

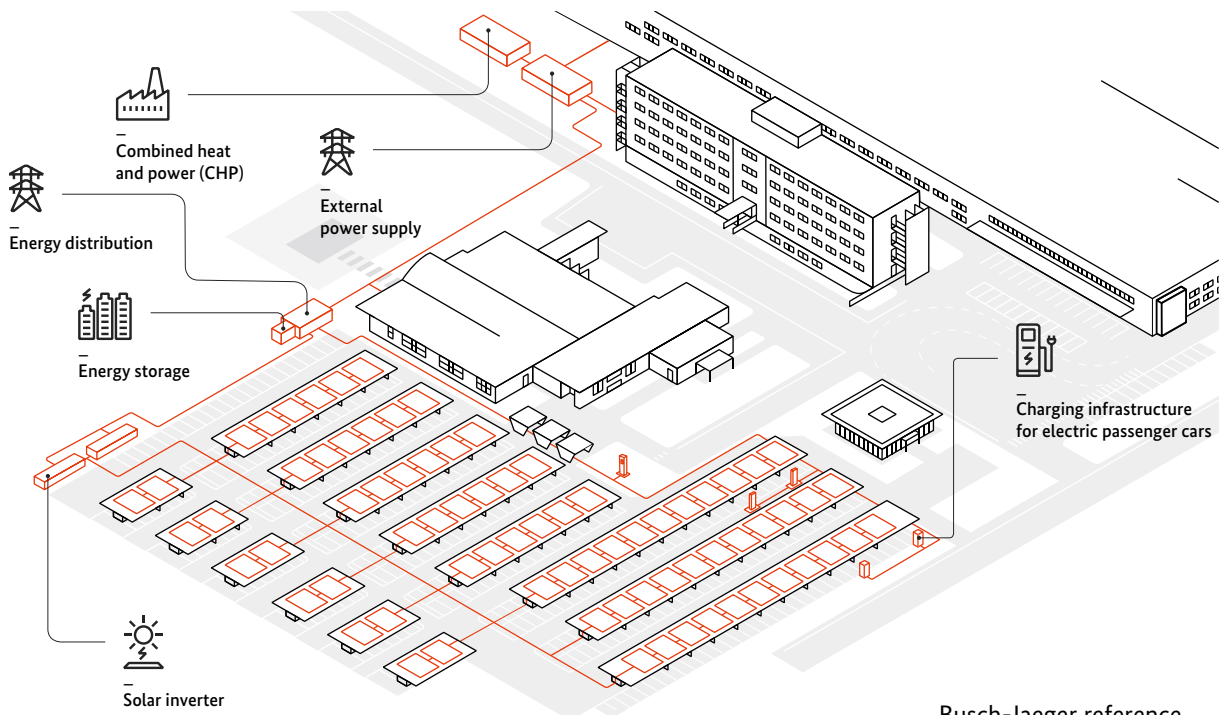
In addition to the provision of products, which enable clients to work in an energy efficient manner, ABB is placing a great focus on implementing its sustainability goals by 2030. The emphasis is on:

- The **conservation of resources** via the introduction of company-wide approaches to the circular economy and the use of renewable, recyclable and biodegradable resources for product manufacturing.
- **No disposal of waste** from in-house operations in **landfills**.
- Reducing carbon emissions at locations to zero – **Mission to Zero**.

Every business area has developed specific areas of actions and projects as they also have differing business models. The business area of electrification has, for example, identified the reduction of plastic raw materials as an area of action, in addition to the Mission to Zero.

It all started with **Mission to Zero**, which was initiated in 2019 in Lüdenscheid, the programme’s first ABB location worldwide. Lüdenscheid was the first location to bring its emissions almost down to zero. High-grade electrical installation products for building control and automation are manufactured at this reference site. Plastic has so far been a key material in this process. Zero emissions is a major challenge for a production site. What is needed are comprehensive solutions that cover all aspects of energy generation, distribution and consumption, and are thus exemplary in complying with the typical requirements of a complex industrial site in a way that is resource-efficient.

A good many small measures also contribute to the zero emissions target. This starts with the carbon neutral production of in-house energy using a combined heat and



Busch-Jaeger reference project, Lüdenscheid
sitemap ABB-Technologie



ABB presents an ultra-modern carbon neutral and self-powered factory of the future at Lüdenscheid

power plant, 7,650 m² of solar panels on car park rooftops, energy use that is as economical as possible in all production and administrative areas, the smart control and coupling of energy sources, and resource-efficient commutes to the site.⁷ Many ABB facilities are now working towards Mission to Zero status and more are beginning this process every year. In addition to actual process flows in administration and production, attention is of course being focussed on the development of resource-efficient products and the use of recycled materials, i.e. recyclates. For example, at the ABB site in Porvoo, Finland, recycled household plastics are reused as raw materials and plastic components made from them.

In Ede in the Netherlands, cables and welding boxes are, for example, also produced from household plastics.⁸ Plastic produced during production and packaging materials are collected by the construction sites and fed back into the recycling loop.

What else can we do? We have to keep asking ourselves this question. Because even if recycling is more resource-efficient, plastic is not comprised of regenerative raw materials. In order to take a further step in the right direction, at Lüdenscheid, ABB is shifting from plastic sourced from fossil fuels to bio-based raw material in its production of the next generation of light switches and sockets.

7 <https://new.abb.com/news/de/detail/23074/pressemappe-mission-to-zero>

8 <https://www.youtube.com/watch?v=QZ3SZq-q6ul>

“Reducing carbon emissions via economical design in Blech” – TRUMPF Werkzeugmaschinen SE + Co. KG



Area of action: product


Economically designed parts are the key to efficient and sustainable manufacturing. Through functional redesigning, production steps can be cut down and individual parts saved, and energy consumption and costs can thus be reduced.

For such functional redesigning and sustainable manufacturing, employees must primarily have expertise in design and manufacturing. Employees need to know what factors drive costs, material choices, effort and processes for prod-

ucts in order to design these and produce with increased sustainability. In addition to pure expertise, however, the appropriate mindset is also essential. There needs to be an openness to rethinking. Tried-and-trusted methods have to be scrutinised in order to trial new options.


The following two examples illustrate how an optimised sheet metal part is created from conventionally manufactured milling components, which decreases both CO₂ emissions and the overall costs of production.


Example 1: Energy chain bracket



Classic Design

- aluminium
- 2 milled part
- high accuracy

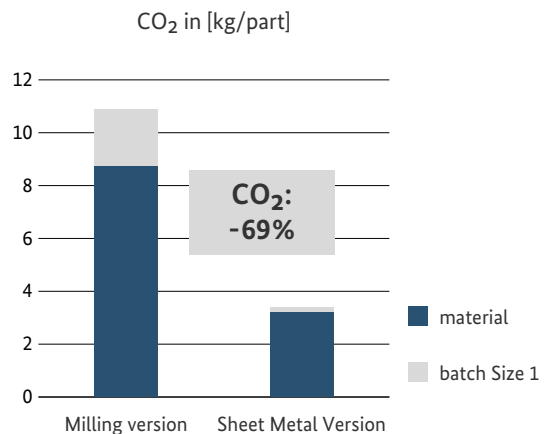




Optimized sheet metal solution


- stainless steel
- 1 bending part
- 4 bends
- sufficient accuracy

Cost: -85%




Source: TRUMPF Werkzeugmaschinen SE + Co. KG


Example 2: Shock absorber bracket



Klassische Gestaltung

- aluminium
- 1 milled part
- high accuracy

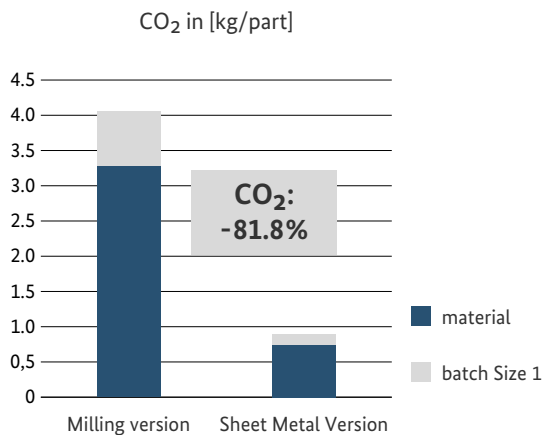




Optimized sheet metal solution

- stainless steel
- 1 bending part
- 3 bends
- sufficient accuracy

Cost: -31%



Source: TRUMPF Werkzeugmaschinen SE + Co. KG

“The good of the environment in business models” – BlueMovement, BSH Hausgeräte GmbH



Area of action: client

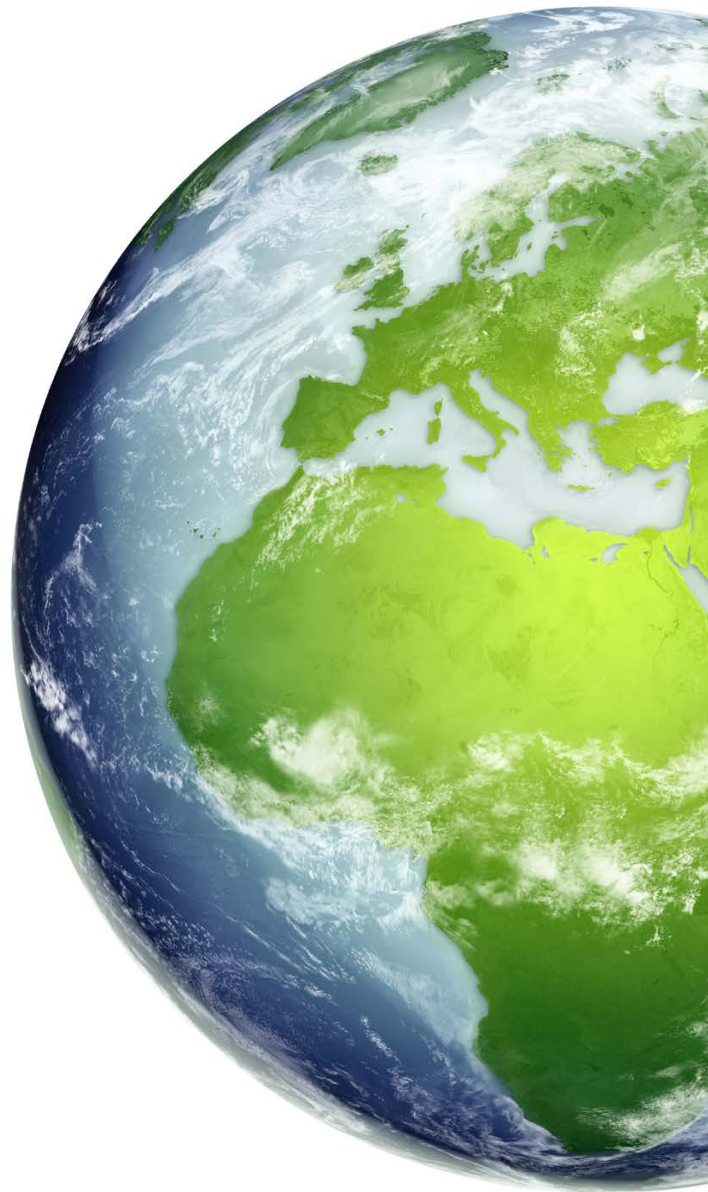
Employees at BlueMovement, a BSH-affiliated startup that offers subscriptions for large Bosch home appliances, have committed to the goal of a circular economy.

In essence, the aim of their sharing economy approach is to reuse products and raw materials, and thus, wherever possible, avoid waste and harmful emissions impacting soil, water and air. They have been leasing new and used home appliances to their clients in Germany and the Netherlands for several years now. In addition to maintenance and repair, the subscription also includes the replacement of faulty devices. The leasing and recycling of old appliances contributes to resource conservation in the long term. The low-cost and flexible rental service is aimed in particular at younger target groups, whose requirements increasingly also include reducing their own ecological footprints. This business model is also based on the conviction that sustainable consumption is only possible if clients are able to make informed purchasing decisions, for example, with the aid of a transparent scoring system.

The decision to offer a subscription for home appliances does not change the product in itself for BSH, but does affect some of the fundamental product criteria. Manufacturing a product with a high degree of reparability and recyclability is now in the interest of the manufacturer, and not only the client and environment.

For the brains behind BlueMovement, green skills primarily include a sufficient level of empathy – for both the planet and for people. This also constitutes the awareness that individual conduct always has an impact on our environment (and vice versa), as well as individual efforts to minimise negative repercussions. This empathy and the necessary shift in perspective can be best conveyed through real experiences of nature.

Apart from this green mindset, the necessary soft skills above all include curiosity and a willingness to change. These are complemented by the analytical skills to be able to record, evaluate and depict progress on the basis of valid data when it comes to sustainability.





SUSTAINABLE ECONOMIC SYSTEM



Key green skills in education and training – Federal Institute for Vocational Education and Training

Current transformation processes in the context of digitalisation, the work around decarbonisation and the energy transition illustrate the need for transversal skills. This umbrella term denotes a set of key skills that enable both trainees and qualified personnel to negotiate the ongoing dynamic transformation in the world of work. The key question is: what can we do today to prepare for the world of tomorrow? There are concepts that are described by different key words depending on the thematic setting. For example, 'green skills' are referred to in the context of the Green Deal in the European context, whereas in the debate around sustainability in the programme *Berufsbildung für nachhaltige Entwicklung* (BBNE – "Vocational Training for Sustainable Development"), the focus is more on the term 'key skills', while in the debate around digitalisation, 'future skills' are discussed. This network of skills reveals a lot of overlap and operates in more general domains, such as systems thinking, literacy, the willingness to take responsibility, transferability and communication skills. These must be fleshed out for vocational training in Germany and anchored in the regulatory instruments of skilled occupations, so that they might be taken up in practice in training and examinations, and be made useful for the future.

Under the Vocational Training Act and the Crafts Code, standard occupational profiles in vocational training were revised as of 01 August 2021, incorporating central aspects of the above debate in the revision. They address the areas:

- Organisation of companies offering training, of vocational training, labour law and collective bargaining law
- Occupational health and safety
- Environmental protection und sustainability
- Digitalised world of work

Under this heading, also referred to as 'the qualifying four', comprehensive skills are specified and a minimum standard set down, which is to be taught in all skilled occupations and by every company offering training. A working group of the main committee of the Federal Institute for Vocational Education and Training, together with representatives from trade unions, the business community and the Federation and the Länder were responsible for modernisation. It was oriented towards the educational goal of a responsible, informed, independently acting employee. Codetermination, rights and obligations of apprentices play as much a role as healthy behaviour, accident avoidance and prevention. Critical reflection and systems thinking is to be taught via the analysis of systemic relationships, conflicting goals, and the evaluation of processes and their reciprocal effects along global value and supply chains. Competent communication in a pluralistic society and in (global) business relations presupposes both an understanding of diverse cultural and interdisciplinary influences, and sensitivity with regard to data protection, data security and handling information online. Independent action is to be strengthened through expertise on the needs of and options for training and the transfer of information gathering skills in a professional context.

The role of the company providing training and in-house training personnel is essential. Initiative and the further development of existing procedure and processes must be valued and innovative action fostered through appropriate methods from the very start of training. Along with social partners supporting businesses, the Federal Institute for Vocational Education and Training provides information and examples of implementation on its homepage.^{9 10}

9 <https://www.bibb.de/en/134898.php>

10 <https://www.bibb.de/de/121439.php>



Learning journey on sustainability

The need for education and training extends to all employees with different focal points and intensities, depending on the sector and starting point. There is no “one size fits all”. To illustrate the practical application of our green skills and to meet the diverse starting points and needs of participants, we have decided on a very agile and simultaneously generally applicable learning method, that of **learning journeys**.

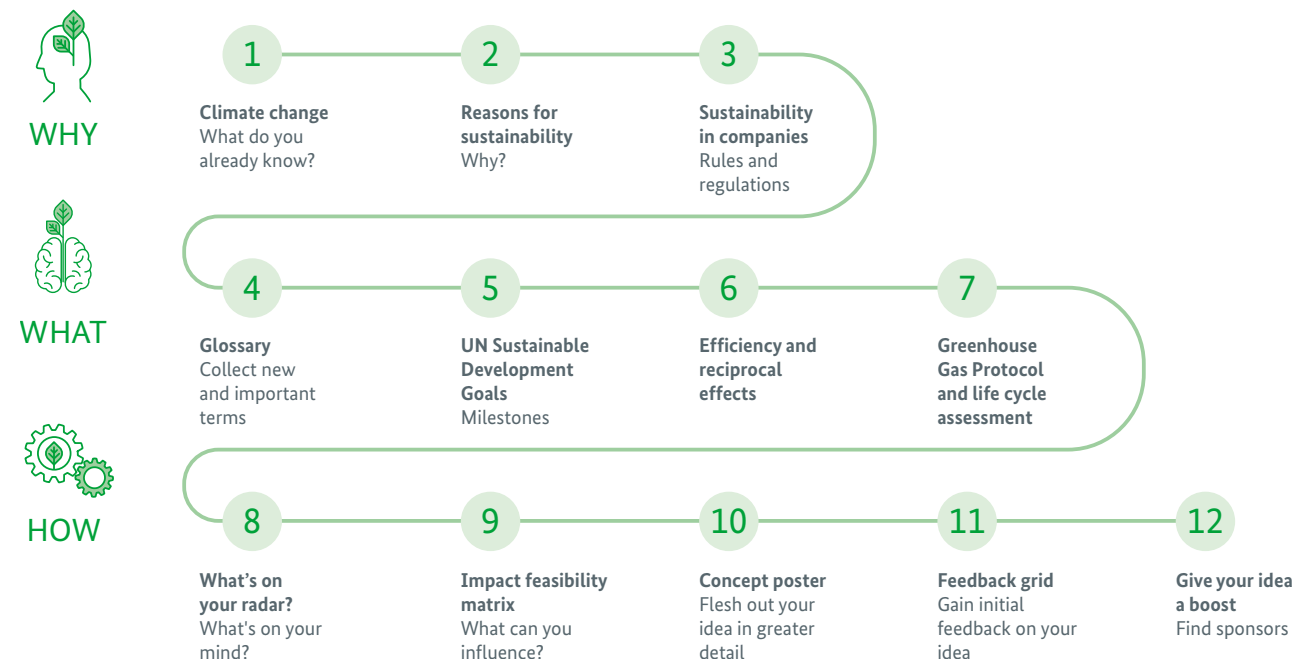
The specially developed learning journey on sustainability provides interested individuals with the opportunity to partake in an initial introduction to the topic of sustainability in-house over twelve weeks.

Learning journeys are structured routes through a series of coordinated tasks, which participants can work on independently and on their own initiative.¹¹

This learning journey provides impulses, opportunities for reflection and mandates for action in order to help employees take a closer look at the topic of sustainability in-house. Participants build a stronger understanding and greater knowledge of issues surrounding sustainability and take a first small step towards implementing sustainability in their own business practices.

The learning journey is divided into 3 sections: **why**, **what** and **how**. In the first section, participants will look at the topic of sustainability, work out the importance of the topic and how sustainable their own corporate practices are. In the second section ‘what’, participants will look at the background, studies and terms relating to sustainability. In the third section ‘how’, everyone will define their own sustainability project. The objective is to attract partners at their own company to work on it with them, because the first step is always the hardest and you can achieve more by working together.

Weekly overview of the learning journey on sustainability



Source: Plattform Industrie 4.0

11 https://unterrichten.zum.de/wiki/Lernpfad#cite_ref-1

The learning journey is designed in such a way that anyone can embark on this journey alone. All participants need about an hour each week to complete it. Every week, there will be one or more tasks and impulses. Participants can work on these at their own pace. Every task has a timeline that is to be understood as a recommendation, to help avoid getting lost in certain topics. But in the end, it is up to the individual how much time they invest in a learning journey.

It is also possible to follow the learning journey as a group. If they choose to do it this way, it is good for participants to find a specific day and hour in the week. While the current week's set tasks can be worked on individually by all participants, the purpose of the joint meeting is to discuss findings and any questions that arise.

The entire learning journey is available for downloading at [this link](#).

Example learning journey on sustainability – Week 1

Objective:

The first 3 weeks look at the aspect 'why': why is it important to deal with the issue of sustainability?

In the first week, you will get to grips with the topic by testing your existing knowledge on the topic of climate change.

Test your existing knowledge



Take 5 minutes:

What terms come to mind when you think of climate change?
Write them down in a list.



Take 5 minutes:

What thoughts do you associate with this topic?
Write them down in a list.



Take 5 minutes:

Where can you go to learn more about this topic?
What media or formats could be useful here?

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