



Train2Sustain – developing capacity to teach sustainability in VET

Unit 4

Sustainability in Practice

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Glossary

Glossary for Units 1 – 7 ALPHABETIC ORDER

Artificial intelligence	Artificial intelligence (AI) is intelligence —perceiving, synthesizing, and inferring information—demonstrated by machines , as opposed to intelligence displayed by non-human animals and humans . Example tasks in which this is done include speech recognition, computer vision, translation between (natural) languages, as well as other mappings of inputs.
Biocapacity	The biocapacity or biological capacity of an ecosystem is an estimate of its production of certain biological materials such as natural resources , and its absorption and filtering of other materials such as carbon dioxide from the atmosphere
Biodiversity	Biodiversity or biological diversity is the variety and variability of life on Earth . Biodiversity is a measure of variation at the genetic (genetic variability) , species (species diversity) , and ecosystem (ecosystem diversity) level.
Carbon footprint	A carbon footprint is the total greenhouse gas (GHG) emissions caused by an individual, event, organization, service, place or product, expressed as carbon dioxide equivalent (CO ₂ e)
Carbon handprint	A carbon handprint is the opposite of a footprint . It recognises the actions you take to have a positive impact on the climate, over and above reducing your own carbon footprint if you do enough of these, they might even outweigh the size of your carbon footprint.
Circular economy	A circular economy is a model of production and consumption , which involves sharing , leasing, reusing , repairing, refurbishing, and recycling existing materials and products as long as possible
Decarbonization	The term decarbonization literally means the reduction of carbon . Precisely meant is the conversion to an economic system that sustainably reduces and compensates the emissions of carbon dioxide (CO ₂)
Deforestation	Deforestation or forest clearance is the removal of a forest or stand of trees from land that is then converted to non-forest use. ^[3] Deforestation can

	involve conversion of forest land to farms , ranches , or urban use. The most concentrated deforestation occurs in tropical rainforests
Eco-design	Ecological design or ecodesign is an approach to designing products and services that gives special consideration to the environmental impacts of a product over its entire lifecycle
Ecological footprint	The ecological footprint is a method promoted by the Global Footprint Network to measure human demand on natural capital , i.e. the quantity of nature it takes to support people and their economies.
Energy-efficient	Energy efficiency is the use of less energy to perform the same task or produce the same result . Energy-efficient homes and buildings use less energy to heat, cool, and run appliances and electronics, and energy-efficient manufacturing facilities use less energy to produce goods.
Environmentally friendly	Environment friendly processes , or environmental-friendly processes (also referred to as eco-friendly , nature-friendly , and green), are sustainability and marketing terms referring to goods and services , laws , guidelines and policies that claim reduced, minimal, or no harm upon ecosystems or the environment .
European circular economy action plan	The EU's Circular Economy Action Plan (CEAP) was a comprehensive body of legislative and non-legislative actions adopted in 2015, which aimed to transition the European economy from a linear to a circular model . The Action Plan mapped out 54 actions, as well as four legislative proposals on waste.
Fertilisers	Fertiliser is any material of natural or synthetic origin that is applied to soil or to plant tissues to supply plant nutrients .
Fossil fuels	A fossil fuel is a hydrocarbon -containing material formed naturally in the Earth's crust from the remains of dead plants and animals that is extracted and burned as a fuel . The main fossil fuels are coal , oil , and natural gas .
Greenhouse emission	Greenhouse gas emissions from human activities strengthen the greenhouse effect , contributing to climate change . Most is carbon dioxide from burning fossil fuels : coal , oil , and natural gas .
Greenhouse Emissions	Greenhouse gas emissions from human activities strengthen the greenhouse effect, contributing to climate

	change. Most is carbon dioxide from burning fossil fuels: coal, oil, and natural gas. The largest emitters include coal in China and large oil and gas companies.
Greenwashing	is a form of <u>advertising</u> or <u>marketing spin</u> in which <u>green PR</u> and <u>green marketing</u> are deceptively used to persuade the public that an organization's products, aims and <u>policies</u> are <u>environmentally friendly</u> .
Holistic process	relating to or concerned with wholes or with complete systems rather than with the individual parts.
Innovation	Innovation is the practical implementation of <u>ideas</u> that result in the introduction of new <u>goods</u> or <u>services</u> or improvement in offering goods or services
Lean management	Lean manufacturing is a <u>production method</u> aimed primarily at reducing times within the <u>production system</u> as well as response times from suppliers and to <u>customers</u> .
Lean principles	The five principles are considered a recipe for improving workplace efficiency and include: 1) defining value, 2) mapping the value stream, 3) creating flow, 4) using a pull system, and 5) pursuing perfection.
Linear economy	he traditional model where raw materials are collected and transformed into products that consumers use until discarding them as waste, with no concern for their ecological footprint and consequences.
Muda, Mura, Muri	Muda, mura and muri are three types of wasteful actions that negatively impact workflow, productivity and ultimately, customer satisfaction.
Organic farming	Organic farming, also known as ecological farming or biological farming, is an agricultural system that uses fertilizers of organic origin such as compost <u>manure</u> , <u>green manure</u> , and <u>bone meal</u> and places emphasis on techniques such as <u>crop rotation</u> and <u>companion planting</u> .
Pesticides	In general, a pesticide is a chemical (such as <u>carbamate</u>) or <u>biological agent</u> (such as a <u>virus</u> , <u>bacterium</u> , or <u>fungus</u>) that deters, incapacitates, kills, or otherwise discourages pests
Product Life cycle	Product life-cycle management is the succession of strategies by business management as a product goes through its life cycle. The conditions in which a product is sold changes over time and must be managed as it moves through its succession of stages.

Product-as-a-service	Product as a service is the concept of selling the services and outcomes a product can provide rather than the product itself.
Pull production	A method of production control in which downstream activities signal their needs to upstream activities. Pull production strives to eliminate overproduction and is one of the three major components of a complete just-in-time production system.
Recycling	Recycling is the process of converting <u>waste</u> materials into new materials and objects. The <u>recovery of energy from waste materials</u> is often included in this concept. The recyclability of a material depends on its ability to reacquire the properties it had in its original state
Renewable energy	Renewable energy is energy that is collected from <u>renewable resources</u> that are naturally replenished on a <u>human timescale</u> . ¹ It includes sources such as <u>sunlight</u> , <u>wind</u> , the movement of <u>water</u> , and <u>geothermal heat</u>
Sustainability	Sustainability is a societal goal that relates to the ability of people to safely co-exist on <u>Earth</u> over a long time.
Sustainable household	A sustainable home is one that is built or retrofitted in a way that conserves resources, optimizes energy and water use and that will last longer with quality systems. A sustainable house is built with low-impact, high-performance materials. They are efficient in terms of manufacturing, shipping, and installing.
Sustainable label	Eco labels set minimum environmental and health standards and verify products that meet the criteria. They're designed to inform consumers, brands, and manufacturers that labelled products are more environmentally friendly than most.
Sway	Sway is a digital storytelling app that helps you create professional, interactive designs for your images, text, videos, and other media in minutes.
The 5s	5S stands for the 5 steps of this methodology: Sort, Set in Order, Shine, Standardize, Sustain. These steps involve going through everything in a space, deciding what's necessary and what isn't, putting things in order, cleaning, and setting up procedures for performing these tasks on a regular basis.

The European action Plan	It aims to: Re-orient capital flows towards sustainable investment, in order to achieve sustainable and inclusive growth; Manage financial risks stemming from climate change, natural disasters, environmental degradation and social issues; and. Foster transparency and long-termism in financial and economic activity.
Value chain	A value chain is a progression of activities that a firm operating in a specific industry performs in order to deliver a valuable <u>product</u> (i.e., <u>good</u> and/or <u>service</u>) to the end <u>customer</u> .
Value stream	A value stream is the set of actions that take place to add value to a customer from the initial request through realization of value by the customer. The value stream begins with the initial concept, moves through various stages of development and on through delivery and support. A value stream always begins and ends with a customer.
Waste management	Waste management or waste disposal includes the processes and actions required to manage <u>waste</u> from its inception to its final disposal. This includes the <u>collection</u> , transport, treatment and disposal of waste, together with monitoring and regulation of the waste management process and waste-related <u>laws</u> , technologies, economic mechanisms.

1 Introduction to Sustainability in Practice

The Topic

Acting sustainably is essential to give also future generations the opportunity to meet their needs. However, it is important that sustainable actions do not only come from EU- or state-level, but also the contribution of all companies, organizations, associations and above all private individuals is necessary. Each one of us has a responsibility to make our planet more sustainable.



But in this context, the question often arises of how to integrate sustainable action into one's private life and into one's education or profession. Fortunately, however, this is not as difficult as one often thinks, because even small changes can have a big impact.

Interaction

Can you think of sustainable measures you could implement in your life? If so, what are they?

To give you some ideas in this regard, this learning unit provides you with an overview of possible sustainable actions. At the beginning, we take a look at private persons as consumers and inputs are given on how they could behave in order to act more sustainably. Subsequently, the focus is directed to companies. Insights are given as to which sustainable actions can be carried out by a company. Since the carbon footprint is an important indicator of how much we negatively affect climate change, it will then be examined in more detail. Finally, it will be shown to what extent today's Industry 5.0 is related to the topic of sustainability.

Practice

If you have not worked on activity A03 "My Way to a more sustainable Future" yet, you could think of considering this activity within this content unit. You could distribute the three days of this project work over the duration of teaching this content unit and let your students think about how they could make their lives more sustainably.

You can find the instructions as well as supporting documents of this activity A03 "My Way to a more sustainable Future" here: <https://www.train2sustain.eu/instructors/electronic-toolbox/>

2 How to act sustainably as a Consumer

You have already learned a lot about sustainability in the last learning units. This chapter is about what YOU can do as a private person to act more sustainably in your life.

Interaction

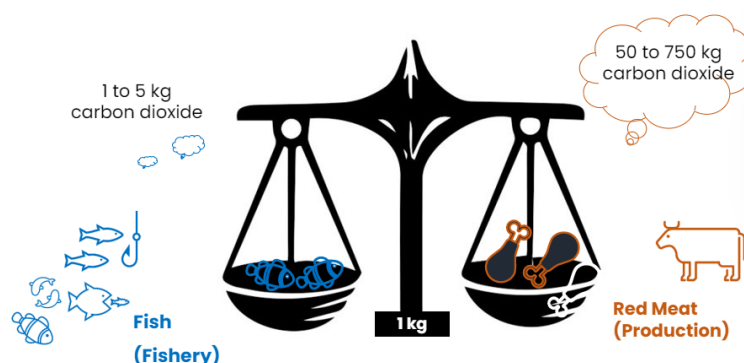
How sustainable is your way of life? What sustainable actions are you carrying out in your life?

Sustainable actions are often perceived as difficult to handle. Therefore, you will find below some tips that are very easy to implement and associated with a low cost and time expenditure.

Nutrition

When buying food, pay attention to the origin of the products. They should come from **organic farming**, and it is advantageous if they only have to be transported a short distance, which means that **regional and seasonal products** should be preferred. An important aspect is also **conscious eating of animal products**, as the production of these is associated with more or less high greenhouse gas emissions. Above all, the production of meat is very pollutant intensive (see figure 1). In the case of fish, for example, care should be taken to eat rather small and local fish. In order to have a better overview of the ingredients of the products you consume, it is advisable **to drink tap water** and to cook more **yourself**. This is the best way to decide on your own what you want to eat.

CARBON DIOXIDE – COMPARISON OF EMISSIONS



Source: IMAS/MSC

Figure 1. Carbon dioxide emissions of meat production vs. fishery

Conscious shopping

Less is often more – this also applies to conscious shopping. When you go shopping, you should **only buy what you really need**, and these products should be of **high quality**, instead of buying a lot of cheap items that are short-lived or that you have to throw away because you don't really need them. Sustainable products are often more expensive than others, but when you consider

how much money you've already spent on things you have at home and don't use, the price difference isn't that big anymore, right? And it should also be borne in mind that **environmentally friendly products** are better for our health. Synthetic fibers and chemical components harm our body and result in increased pollution of our waters, which in turn leads us to ingesting them with our food.

Travel and mobility

Of course, not every person can completely live without a car and it should not be the case that no one is allowed to fly on holiday anymore. But it would be important for everyone to consider whether one could make certain journeys with a **more environmentally friendly means of transport**. If, for example, you are dependent on a car during the week, you could try to do without it on weekends and instead go **by bike** or **public transport**. Or short-distance flights could be replaced by **travelling by train**, if there are pleasant connections. The use of **car-sharing services** would also be a good alternative. And especially on holiday, one could consider not going for environmentally harmful offers such as boat trips.

Sustainable household

Especially within our own four walls, a lot can be done to protect our planet. An important factor is to **avoid waste**. For example, you should not use disposable products such as straws or plastic dishes. **Items that are broken or no longer used** should not simply be thrown away, but they could be **resold or donated, or brought for repair**. Even if a lot of **waste** can be avoided, it is nearly impossible to avoid all of it. Therefore, it is important to at least **separate** and **dispose of** it **correctly**.

To ensure that **food** is free of pesticides or other chemicals, it **could be grown at home**. Even a small balcony or terrace is usually sufficient to grow at least some vegetables or herbs.

Also in terms of **energy and water**, a lot can be done to live more sustainably. So, both should **be saved**, i.e. devices should be switched off and the water turned off as soon as you no longer need them. We all should **use energy-efficient devices** (which also leads to cost savings) and we could also consider switching to **solar energy**.

Digression

When you click on this link, you can find out how much energy your household appliances consume: https://energyusecalculator.com/calculate_electrical_usage.htm

But the most important thing about all these tips is that we all **start to implement** them and to act sustainably. As soon as we get used to these actions, we can also convince other people of the importance and simplicity and thus contribute to a greener planet.



As already mentioned above, **sustainable shopping** is an important step towards sustainable action. This refers on the one hand to shopping in a sustainable, **conscientious way**, but on the other hand **to buying products that are sustainably produced and durable**.

Therefore, you can find here some tips on how to shop sustainably:

- Think carefully about which products you really need. Buy an item only if you are sure you will use it at least 30 times.
- If you shop online, take some time and wait for a few minutes before you order items from your cart. Thus, you can think again whether you really need them and impulse buying can be avoided.
- Buy second-hand products. They look just as nice as new ones, are usually cheaper than those, and you have the possibility to get some unique things. In many cities, there are already shops where you can donate used items, but also take some home for free.
- Try to repair broken items before you buy something new. With a few simple tools and a little creativity, you can design your very own unique pieces.
- Shop at regional shops and artists to promote them and prevent long-distance transport routes.
- When it comes to clothing, be sure to buy products made from natural materials.
- Look for companies that take back products for repair, re-manufacturing or recycling.
- Use baskets or cloth bags for shopping and avoid buying plastic bags.

Another aspect that should be considered when shopping is whether a **sustainability label** can be found on a product. In **order to make it visible that products are sustainable or have been manufactured sustainably**, they are provided with various certificates or labels. In order to determine whether a product may bear such a label, various factors are taken into account. These include:

- Material used
- Use of recyclable raw materials
- Consideration of social aspects along the value chain
- Avoidance of substances harmful to the environment and health during production

These sustainability labels are assigned, for example, for food, clothing, cosmetics, electronics, but also for completely different industries such as tourism. Examples for these categories can be found here:

Food



Textiles



Cosmetics



Electronics



Tourism



A broader overview of different labels including short explanations can be found on these pages:
https://www.siegelklarheit.de/en/siegel#/sort:rating_desc or
<https://www.ecolabelindex.com/ecolabels/?st=region=europe>.

Indicator

If a product is marked with such a seal, certain sustainability criteria have been checked, but it is still not possible to determine exactly whether the product has really been treated sustainably along the entire value chain.

Practice

To let your students find out more about their ecological footprint, you could include activity A08 "Ecological Footprint" into your teaching. For this activity, the students have to calculate their own ecological footprint and afterwards they develop a personal plan to improve their results.

You can find the instructions as well as supporting documents of this activity A08 "Ecological Footprint" here: <https://www.train2sustain.eu/instructors/electronic-toolbox/>

Although the majority of respondents in surveys usually agree that today's environmental problems are enormous and that we all have to contribute to the protection of our planet, **private consumption still contributes greatly to climate change**. Sustainability awareness does not mean that a person actually acts sustainably. There can be many reasons for this:

- People often have the feeling that they have to sacrifice something through sustainable behavior, e.g. they are not allowed anymore to fly on holiday.
- Sustainable shopping is often associated with high costs and cumbersome conditions.
- With the large offer of products as well as the various labels and countries of origin, many people are not able to identify products that actually are sustainable.

Therefore, it is **necessary to support the consumer in his or her decisions and actions**. Countries as well as companies, organizations, educational institutions and private individuals should contribute to eliminating existing prejudices regarding **sustainable products and to reducing information deficits**. In this context, right communication is an important factor. For example, the needs of different target groups must be taken into account for communication, and communication must be done in a way that attracts these people. And of course, it is also necessary that we as individuals are rethinking and starting to act sustainably in order to protect our planet.

Indicator

At first glance, it is often difficult to judge whether certain actions are actually sustainable or not. Some seem to be sustainable, but on closer inspection they are not, and vice versa. You can find a few examples of this in this video: <https://www.youtube.com/watch?v=9u0NrMuORgk>

Therefore, it is very important to take a closer look at (un)sustainable practices in order to find out how sustainable they actually are.

Indicator

If you want to find out more about how you can act more sustainably as a teacher, you can read CU7 Sustainability in Education.

3 How to act sustainably as a Company

As you have already read, it is **important that companies are committed to more sustainable actions**. In this context, the term **Corporate Social Responsibility (CSR)** emerged. CSR includes all actions an organization implements in order to do something that benefits the relation between the organization itself and the community as well as the environment.

But a switch to more sustainable processes and products is often seen as negative because it often involves investments and a large effort of time. However, these sustainable activities not only help to protect our planet, but also bring **numerous benefits** for a company:

- Sustainable actions increase the image of a company which is very valuable because more and more stakeholders attach importance to that.
- By designing sustainable processes, costs can be reduced, e.g. energy costs.
- Higher prices may be charged for sustainably produced products.
- In many countries, companies that invest in sustainability are supported by the government.
- Employees can often identify better with a sustainable company, which leads to higher satisfaction and motivation.

Indicator

Due to the advantages of sustainable actions, many companies unfortunately engage in **greenwashing** which means that they pretend to act sustainably even though they do not actually do it. Therefore, it is advisable to check carefully before buying a product whether this is actually a sustainable product.

But what can be done in a company to promote sustainability? Here are some examples:

- Saving of electricity and water, e.g. through the use of energy- or water-saving devices
- Reduction of the use of primary raw materials
- Use of environmentally friendly packaging and economical use of it
- Combining multiple orders into one delivery
- Going to work or doing business trips on foot or by bicycle
- Participation in environmental projects
- Shopping for sustainable products (food, office supplies, ...)
- Avoid printing
- Completely disconnecting devices from the mains as soon as they are not needed
- Changing the electricity provider to green electricity
- Purchase of sustainable workwear
- Waste separation
- Purchase of second-hand furniture
- Drinking tap water
- Creating a habitat for animals

- Fair remuneration and respectful treatment of employees
- Creation of training opportunities for employees
- Promoting the work-life balance of employees
- In addition, you will find more concrete examples in this video:

<https://www.youtube.com/watch?v=CfM0MxBfi2g>

It should be noted that these sustainable activities **must be taken into account along the entire supply chain**, i.e. from gaining raw materials, through transport, production and sales to product returns and recycling processes as demonstrated in figure 2.



Figure 2. An example of a supply chain

A supply chain is sustainable if it is green, transparent and circular.

A green supply chain is characterized by the fact that all its **processes are designed to be environmentally friendly**. Examples of this are the saving of primary and the use of secondary raw materials, the use of environmentally friendly means of transport, sustainable production processes using renewable energy and a conscious use of the products by consumers.

However, even after the end of the lifetime of a product, sustainable actions must be taken in order to contribute to a **circular economy**, such as repairing, reusing or recycling used products or raw materials. In order to make all these processes more sustainable, AI and machine learning can be used.

To be credible to the outside world as a sustainably acting company, it is important **to make the supply chain transparent**, e.g. by providing people with information about the origin of the products, the working conditions and the practices used.

Since the term sustainability also includes the social component, it is important that companies **treat their employees respectfully and fairly across all processes**.

Example

An example of a company that successfully uses AI to contribute to sustainability is **Henkel Ibérica**. If you want to find out more about AI, the company and its sustainable practices through AI, you can read the following article on our project website:

<https://www.train2sustain.eu/the-contribution-of-artificial-intelligence-to-sustainability/>

Practice

It would be important that your students take some time and think about their own work. Are they acting sustainably in their occupation? What could be changed? You could do activity A06 "Sustainable occupations news" with them in order to analyze that.

You can find the instructions as well as supporting documents of this activity A06 "Sustainable occupations news" here: <https://www.train2sustain.eu/instructors/electronic-toolbox/>

In order for a company's stakeholders to know that sustainable practices are being applied, it is necessary to communicate this to the outside world. But what should be considered in this context?

- **Credibility:** Only by carrying out sustainable actions, a company shows that it is serious about the sustainability aspect
- **Transparency:** It is important for customers to be able to understand the actions of companies in order to build trust. Setbacks should also be communicated, as this makes a company more authentic.
- **Willingness to enter into dialogue with end consumers:** The target group of consumers should be involved in the implementation of the sustainability strategy, e.g. by being allowed to communicate their opinion via social media. This creates the feeling of being heard and the company can further develop its strategy.
- **Continuity in communication:** Communication about sustainability should go on continuously, even in difficult situations and setbacks.

Practice

Your students have already heard a lot about sustainable practices within a company. To let them find out more about real companies and their strategies, you could start activity A07 with your students. They will have to search for a certain company and collect information about their sustainable actions. In addition, they should find out how the communication about sustainability is handled by them.

You can find the instructions as well as supporting documents of this activity A07 "Webpage of a Company" here: <https://www.train2sustain.eu/instructors/electronic-toolbox/>

4 From a Carbon Footprint to a Carbon Handprint

In today's world, almost every person leaves a large **carbon footprint**. But what exactly does that mean?

The carbon footprint indicates **how many greenhouse gas emissions are emitted into the environment by a person, an organization or a product**. It is usually given in tons and contains, among other things, carbon dioxide and methane. All these gases cause heat to be retained in the atmosphere, leading to **global warming**, which subsequently accelerates climate change and thus has a negative impact on our planet.

For **private individuals**, this footprint is usually caused by **transport, housing and nutrition**. Watch the following video to get to know a few examples: https://youtu.be/8q7_aV8eLUE.

Practice

Have you ever thought about how big your carbon footprint is? If you want to find out, you can use the **Carbon Footprint Calculator** by clicking on the following link:

<https://www.carbonfootprint.com/calculator.aspx>

After calculating your footprint, you will find out how many tons of carbon dioxide you have generated in the period of the calculation. To stop climate change, it is **important to reduce this footprint** and bring it to zero as much as possible.

Regardless of how high your footprint is, there are certainly still some actions you could take to reduce it. Most of the tips you have already received in the subchapter "How to act sustainably as a consumer" also apply to reducing your carbon footprint. Nevertheless, we would like to provide you with an overview of some actions that you can implement:



Mobility

- Fly only as often as it really needs to be.
- Think carefully about whether you need to use a car for all your journeys or whether you could also go by bike or walk.
- To go on vacation, you could also use the train.
- For the way to work or private trips, you could use car sharing offers.



Clothing

- Take good care of your clothes.
- You could borrow clothes or buy them at a second-hand shop.
- If a garment no longer suits you, you could donate it or re-design it in a DIY project instead of throwing it away.
- Buy garments that have been responsibly made.



Food

- Be sure to buy regional and seasonal products.
- Meat consumption could be reduced and for both meat and fish it is important that the products come from sustainable agriculture/fisheries.
- If you go shopping, you could take reusable bags with you and try to avoid products with plastic packaging as much as possible.
- Only buy as much as you really need in order to avoid waste.
- In many cities and towns you can find applications and/or shops where you can buy discounted items in the evening, e.g. Too Good To Go. So you can save money on the one hand and save food from being thrown away on the other.



Energy and waste

- Heat only as warm as needed. It makes a big difference if you turn down the heating just for one degree.
- Try to save water, e.g. by taking a short shower or turning water off while you soap up or brush your teeth.
- Use energy-efficient products in your household, preferably class A, and do not let them run in standby mode.
- Turn off the light as soon as you no longer need it.
- Try to avoid and recycle waste where possible.

Digression

Did you know that the use of the Internet also entails an enormous energy consumption? This is called a **digital footprint**. This footprint is not neglectable as it already has a greater impact on our environment than air traffic.

Examples of the digital footprint are the storage of data in a cloud, the use of streaming services or cashless payment. Cryptocurrencies such as Bitcoin also cause huge energy consumption.

As you have already learned in the previous content units, the problem of climate change has already been recognized and numerous offensives have been launched to counteract it. As a result, a new term emerged: the **carbon handprint**. This handprint is an indicator of the potential to stop climate change. It indicates the **extent to which greenhouse gas emissions can be reduced if previous activities or products are replaced by ones that have a positive impact on our environment**.



Indicator

With regard to the carbon footprint, the goal is to carry out positive activities in order to keep it as low as possible. The carbon handprint, on the other hand, is not about reducing negative impacts, but about **carrying out actions that have the hugest possible positive impact on the environment**.






The carbon handprint is often seen in relation to companies. If a company acts in such a way that it generates the highest possible carbon handprint, the carbon footprint of customers can be reduced at the same time.

Interaction

What actions could a company carry out to become carbon neutral? Can you think of any?

For example, companies could perform the following actions (see table 1).

Table 1. Possibilities for a company to increase their carbon handprint.

 Less GHG intensive material use	<ul style="list-style-type: none"> • Replacing non-renewable, greenhouse gas (GHG) intensive materials • Avoiding materials use • Increasing material-use efficiency
 Less GHG intensive energy use	<ul style="list-style-type: none"> • Replacing non-renewable, GHG intensive energy and fuels • Avoiding energy and fuel use • Increasing energy efficiency
 Increased lifetime and performance	<ul style="list-style-type: none"> • Lengthening the lifetime of a product • Enabling the performance improvement of a product
 Reduced waste and losses	<ul style="list-style-type: none"> • Reducing waste and losses • Contributing to recycling, reuse and remanufacture
 Increased carbon capture and storage	<ul style="list-style-type: none"> • Contributing to GHG sinks through land-use change • Removal of carbon into biomass • Storing of carbon into products

Source: https://cris.vtt.fi/ws/portalfiles/portal/22508565/Carbon_Handprint_Guide.pdf

If the carbon handprint is increased, it could balance the carbon footprint. If both factors are the same size, a person or organization is **carbon neutral**.

Indicator

In the following video, the concept of the carbon handprint is explained to you again:

<https://www.youtube.com/watch?v=CtH6M5CXruU>

5 Industry 5.0

When talking about companies and what they can do to act more sustainably, the term Industry 5.0 should be introduced to you because in this Industry 5.0, a link between sustainability and the success of a company can be found.

Digression

You've probably heard of the term **Industry 4.0** before. This refers to a strong digitalization in production, which aims at interlinked production processes and self-control of machines. Networked systems are intended to ensure that machines control themselves independently and intelligently and thus more efficient processes can be designed across companies.

To make this possible, the Internet is a central factor, and all devices and machines must be equipped with sensors and digital information paths.

But in Industry 4.0, through the focus on the automation of processes an important aspect was ignored: **the human**. However, since it was recognized that people are an indispensable part of a successful company, a new term has developed – namely Industry 5.0. But what exactly is meant by the term Industry 5.0 and how is this related to sustainability? You will learn about this in the following pages.

As already mentioned, industry 5.0 focuses on people. But two other principles also play a decisive role: **resilience** and **sustainability**. See figure 3.

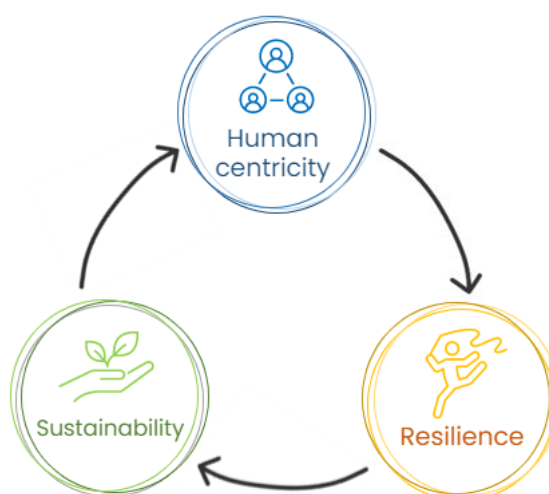


Figure 3. Principles of Industry 5.0

Human-centricity:

The focus is on the **interaction between a person and a machine** – the technology should only be used to such an extent that it supports people in their work in the best possible way. The staff, on the other hand, should be supported and motivated as much as possible, with the promotion of talent and diversity playing a major role.

Resilience:

In a time of change and uncertainty, it is important to design a company in such a way that it is resilient. It should be **resilient to crises and unpredictable events**. So even if such an event occurs, it should be ensured that the most important infrastructure in a company is still functional. In addition, flexible and adaptive systems are necessary to be able to adapt to changes.

Sustainability:

It is not only important to develop interlinked, self-controlled systems, but also to **make** sure that the **processes within a company are circular**. In Industry 5.0, sustainable activities as well as the protection of our planet and respect for its limits play an important role.

Industry 5.0 is therefore a concept that aims to make human work as efficient as possible and to provide the best possible support through technology, to develop flexible and adaptable processes and to contribute to the protection of the environment.

Indicator

It should be mentioned that the addition 5.0 is somewhat misleading. This approach is actually not intended to replace Industry 4.0, but to complement some important aspects such as humans.

As you have already learned, Industry 5.0 places great emphasis on sustainability. All **3 pillars of sustainability are included**: Industry 5.0 promotes economic growth, while also taking into account the interests and needs of employees and contributing to a greener planet.

In the following, you can find some examples for the promotion of sustainability in Industry 5.0:

- Energy consumption is still very high and many greenhouse gases are emitted into the environment. In order to reduce costs and emissions and at the same time be less dependent on others, many countries/companies are pushing ahead with a switch to alternative, environmentally-friendly forms of energy.
- In order to counteract the enormous consumption of resources, a circular economy is strived for. The aim is to keep resources in circulation for as long as possible and to use secondary raw materials as often as possible. You can find out more about this in CU5 Circular Economy. Through the use of AI, for example, cooperation between humans and robots can be supported in such a way that sustainability guidelines can be adhered to more easily and resources can be used more efficiently.

6 Summary

In order to succeed in combating climate change, we must all contribute to it **with our actions**. This can happen in many different areas, such as nutrition, travel and mobility, or in terms of water, energy and waste. Especially when **shopping**, we can take many factors into account in order to act sustainably. It is important to think carefully about which products you really need and whether they actually have to be new ones, or whether you could not also buy second-hand products. The materials and origin of the products should also be taken into account. In order to make it easier for us consumers to select sustainable articles, various **sustainability labels** are assigned.

But not only we as private individuals have to rely on sustainable activities, but especially **companies**. In addition to positive effects on the environment, acting sustainably brings additional advantages for companies. Sustainable actions can and must be implemented along a company's **entire supply chain**, with technological developments such as **Artificial Intelligence** playing a major role. In order to give customers a clear picture of the fact that a company acts sustainably and to build trust in it, **transparent communication** is important.

So far, the **carbon footprint** of our population, i.e. the greenhouse gas emissions that we release into the environment, is still relatively high. Therefore, it is important that we all contribute to lowering it towards zero. Actually, we should not only try to reduce it, but rather we should strive to **generate a carbon handprint** in order to have an even more positive effect on climate change.

Fortunately, it has already been recognized that people and sustainability play an important role in industry. This can be seen in the context of **Industry 5.0**, in which a successful company is characterized by the fact that it **focuses on employees**, is **adaptable and resilient**, and **incorporates sustainability factors** into its work.

So there are already numerous starting points for actions to stop climate change and protect our planet. If we all do our best and push for sustainable action, we can take a big, joint step in the right direction.

7 Resources

Acting sustainably as customer

<https://www.msc.org/de/blog/mehr-nachhaltigkeit-tipps>

<https://www.runnersworld.de/laufbekleidung/siegel-fuer-nachhaltigkeit/>

<https://www.earthday.org/toolkit-how-to-shop-for-your-clothes/>

<https://www.thecut.com/2022/04/guide-to-shopping-long-lasting-sustainable-ethical-clothes.html>

<https://www.oxfam.org.uk/oxfam-in-action/oxfam-blog/guide-to-sustainable-shopping/#:~:text=Sustainable%20shopping%20means%20shopping%20in,materials%20that%20can%20last%20long.>

<https://www.umwelt-im-unterricht.de/hintergrund/umweltbewusstsein-konsumverhalten-und-nachhaltiger-konsum/>

Acting sustainably as company

<https://www.learningtogive.org/resources/corporate-social-responsibility-and-sustainability>

<https://www.starting-up.de/praxis/organisation/nachhaltigkeit-in-unternehmen-vorteile-im-ueberblick.html>

<https://www.impulse.de/management/unternehmensfuehrung/nachhaltigkeit-unternehmen/7378865.html>

<https://www.wko.at/service/umwelt-energie/grundlagen-nachhaltigkeit-unternehmen.html>

<https://www.sap.com/austria/insights/what-is-a-sustainable-supply-chain.html>

<https://dmexco.com/de/stories/wie-wichtig-ist-nachhaltigkeitskommunikation-fuer-brands-und-das-employer-branding/>

From a carbon footprint to a carbon handprint

<https://www.nytimes.com/guides/year-of-living-better/how-to-reduce-your-carbon-footprint>

https://europa.eu/youth/get-involved/sustainable-development/how-reduce-my-carbon-footprint_de

<https://www.carbonfootprint.com/calculator.aspx>

https://cris.vtt.fi/ws/portalfiles/portal/22508565/Carbon_Handprint_Guide.pdf

Industry 5.0



<https://www.wfb-bremen.de/de/page/stories/digitalisierung-industrie40/was-ist-industrie-40-eine-kurze-erklaerung>

<https://industriemagazin.at/expertenpool/industrie-50-wir-haben-da-etwas-vergessen/>

<https://www.platforme.com/blog/industry-5-0-building-a-more-sustainable-human-centric-and-ethical-industry>

<https://www.i-scoop.eu/industry-4-0/industry-5-0/>

https://research-and-innovation.ec.europa.eu/research-area/industry/industry-50_de#how-to-make-it-happen

<https://knowhow.distrelec.com/de/internet-der-dinge-iot/industrie-5-0-der-nachste-schritt-fur-die-industrielle-produktion/>