

# GREEN DIGITAL Toolkit

Improving the environmental  
sustainability of ICTs in  
companies



Co-funded by  
the European Union

2023

Green Digital - Improving the environmental sustainability of ICTs in companies  
R1 – Green Digital Toolkit

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The editing of this document was finished on December 2023

Project website: <https://www.greendigital-project.eu/>

Green Digital is an Erasmus+ Cooperation Partnership in VET sector.  
Project Number: 2022-2-IT01-KA210-VET-000096922.

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This document has been created by the collaboration of the whole Green Digital partnership: Learnable (IT)-project Coordinator, European Center of Entrepreneurship Competence & Excellence (AT), The Common Ones (DK).


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# Introduction

The purpose of this toolkit is to provide practical resources and guidelines for companies seeking to embrace sustainable ICT practices.

It addresses the growing need for businesses to align their operations with environmental goals and contribute to a more sustainable future.

The toolkit covers various aspects of sustainable ICT practices, including energy consumption, e-waste management, carbon emissions, and efficient communication.

This toolkit has been developed through extensive research and collaboration with diverse stakeholders, including businesses, experts, and sustainability practitioners. The development process involved conducting research studies and engaging in focus groups across Italy, Denmark and Austria. By involving participants from these countries, the toolkit aims to provide insights and recommendations that are relevant and adaptable to different regional contexts and business environments.

The research phase explored the specific needs and priorities of businesses collecting input and feedback that have shaped the content and structure of this toolkit, ensuring its applicability and effectiveness in real-world scenarios.

By utilizing this toolkit, companies will gain valuable insights and practical strategies to incorporate sustainable ICT practices into their operations.

Whether you are a small startup or a large corporation, this toolkit offers guidance on measuring environmental impact, managing ICT equipment and operations, setting targets and goals, and continuously improving sustainability practices.

# ICTs ecological impact

## the problem

### Digital carbon footprint

It is the CO<sub>2</sub> emissions resulting from the production, use and data transfer of digital devices and infrastructure.

### Digital growing of companies

-Due to the COVID-19 pandemic companies have implemented digital work processes from 25 to 40 times more quickly than expected

-The integration of digital technology in companies has grown by 42%.

-Furthermore, there are still 1.2 million businesses (with 10 to 249 employees) across Europe that have yet to adopt digital technologies.

ICT is currently one of the fastest growing greenhouse gas-emitting and energy management sectors

-Digital technologies in 2018 emitted more greenhouse gas than civil aviation.

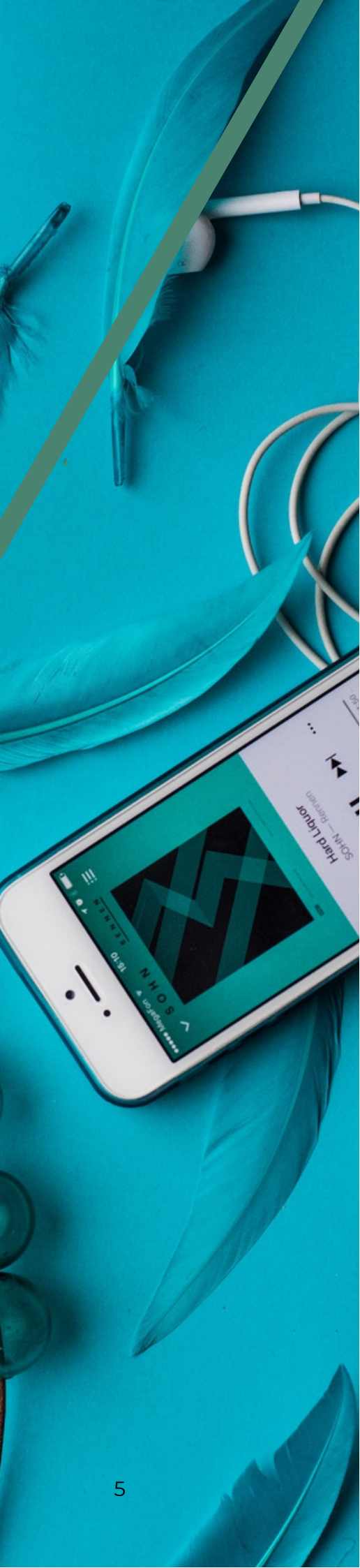
-This amount is projected to reach in 2025 8% of all GHG emissions (about the share of car emissions)

-ICTs' energy consumption is estimated at 5-9% of the world's total electricity use.

-E-waste is the most rapidly growing waste problem in the world. We generate about 50 million tons of it every year. This is equivalent to throwing out 1000 laptops every single second.

-In some places the amount of e-waste increases with 500 % in the years to come.





A sustainable and wise use of ICTs in companies may lead to a reduction of environmental impact and costs for energy consumption.

- globally emails could account for about 0.3% of the world's carbon footprint.
- 1 megabyte e-mail emits around 19 grams of CO<sub>2</sub>. This is equivalent to a 60W lamp switched on for 25 minutes.
- 20 emails per day per 20 company employees in a year create the same CO<sub>2</sub> emissions as a car travelling 1000 km.
- a simple email without attachments corresponds to the carbon footprint of a plastic bag.
- Globally, the world's email usage contributes as much CO<sub>2</sub> as having an extra seven million cars on the road, all because of the amount of energy required to operate them.
- On a worldwide scale, it's estimated that the transmission of data networking can consume around 1 to 1.4% of the electricity used in the world.
- cost of data transfer and storage is about 5 kWh per gigabyte, which equates to about \$0.51 of energy costs.

# The benefits of ICTs sustainability actions



Cost savings



Increased Efficiency



Reduced Environmental Impact

## sustainable ICT practices offer numerous benefits

- Implementing sustainable ICT practices lead to significant cost savings for businesses. By reducing energy consumption and optimizing resource utilization, organizations lower their utility bills and operational expenses. For example, virtualization and cloud computing help consolidate hardware, leading to reduced hardware costs and maintenance expenses.
- Sustainable ICT practices promote resource efficiency and productivity. By optimizing energy use, organizations achieve higher operational efficiency and reduce waste. For instance, implementing energy-efficient hardware and optimizing cooling systems in data centers result in better performance and reduced energy consumption.
- Sustainable ICT practices contribute to mitigating the environmental impact of technology operations. By reducing energy consumption and adopting renewable energy sources, organizations lower greenhouse gas emissions and their overall carbon footprint. This supports environmental sustainability goals and helps combat climate change.



of the global electricity consumption is used for production and operation of ICT (by 2030)

Source: Digital Information World



increase in production of e-waste in the last five years—55.5 million tons

Source: Capgemini



of executives are aware of their organization's IT carbon footprint

Source: Capgemini

# Strategies for implementing sustainable ICT procedures

## How to become a green digital manager

- **ICT Energy Consumption:** Measure the energy consumed by ICT equipment and operations. This can be achieved by collecting energy bills, installing smart energy monitoring systems, and implementing energy-saving measures.
- **ICT Carbon Footprint:** Calculate the greenhouse gas emissions associated with ICT activities. This can be done through the use of online calculators, by hiring consultants, or by collaborating with third-party assessment parties.
- **Product Recycling Rate:** Measure the percentage of ICT equipment, such as computers, smartphones, and other devices, that is recycled or repurposed.
- **Data Storage Management:** Assess the amount of data produced or consumed in a year, typically measured in gigabytes. This analysis helps understand the impact of data storage and processing on energy consumption, allowing for targeted optimization efforts.
- **Digital Health:** Measure the amount of time spent on screens or devices in a year. This metric sheds light on the organization's efforts to promote a healthy work-life balance, reduce digital fatigue, and enhance employee well-being.

1

### Set Targets and Goals

To develop a comprehensive approach to sustainable ICT practices, it is crucial to set appropriate targets and goals that align with your organization's sustainability objectives. These targets should encompass various aspects of sustainable ICT practices and can be effectively monitored by establishing Key Performance Indicators (KPIs). Here are some relevant KPIs to consider:

In addition to these metrics, it is worth exploring other potential targets and goals, such as :

B corps certification and Future fit business framework.

When evaluating the impact of operations, it is essential to take a holistic approach and consider the entire value chain. By examining both upstream and downstream activities, organizations can ensure that efforts are made to reduce overall CO2 emissions throughout the system.



## 2

## Manage Your strategy

In order to effectively manage your strategy, it is important to identify the specific areas of ICT that will help you achieve your sustainability goals. These areas include Communications, Infrastructure, Energy, Devices, Data management, and Digital Health. Implementing appropriate actions within these areas, such as Avoiding, Reducing, Replacing, Recycling, and Offsetting, will help mitigate your environmental impact. Here are some specific actions to consider:

**Avoid, Reduce and Replace...**

### Devices

- Instead of leasing devices every two to three years, aim to increase the lifecycle of devices to a four-year period. This not only extends their usability but also significantly reduces the carbon footprint. It is essential to demand support extensions from suppliers and advocate against software-driven obsolescence.
- Explore virtual desktop infrastructure (VDI) and Desktop as a Service (DaaS) offerings to minimize electronic waste generation. Unlike local desktops that require frequent replacement, virtual desktops can be easily updated and maintained from a centralized location. However, it's important to consider the CO2e output of these workloads based on their geographical region.
- Procure devices from greener manufacturers who prioritize sustainability in their production processes.

## Digital and Hardware Infrastructure

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- Optimize airflow management to improve cooling efficiency instead of relying on poor ventilation layouts for equipment.
- Design and develop lightweight, flexible, and quick-loading websites and applications. Faster loading speed leads to reduced energy consumption
- Simplify user interfaces to make them more intuitive and efficient. Avoid complex UX designs that demand more user time and energy, favoring streamlined processes.
- Remove unused features and functions from digital environments. Eliminate anything that is not being utilized to optimize energy efficiency.
- Consider using carbon-neutral cloud providers who have committed to becoming carbon-neutral or carbon-negative in the near future. For example, Google offers features on their cloud console to help IT professionals make environmentally friendly computing resource choices.
- Replace traditional hardware with energy-efficient alternatives.
- Implement green software best practices to replace traditional software development methods.

## Data Management and Communications

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- Minimize waste associated with unsolicited emails and text spam. Avoid sending, receiving, and storing unnecessary messages.
- Utilize spam filters to reduce the CO2e emissions linked to unsolicited emails and prevent them from cluttering inboxes.
- Reduce the size of emails, particularly if there is a high frequency of sending large attachments.
- Maintain a clean contact list to ensure that messages are only sent to recipients interested in the content and offer easy unsubscribe options.
- Use segmented lists to tailor messages, reducing the number of emails sent and targeting recipients more effectively.
- Optimize data storage and cloud usage by deciding which data needs immediate access and which can be stored on long-term storage mediums that require less frequent access.
- Minimize streaming time within the office environment.
- Schedule power-intensive tasks, such as designing and editing, to make the best use of resources.

## Energy

- Encourage energy-efficient practices throughout the organization. This includes turning off equipment when not in use, enabling energy-saving features, and optimizing power management settings.
- Implement tips for office equipment, building heating, and lighting to reduce energy consumption and operating costs.
- Activate energy efficiency settings on your devices.
- Invest in renewable energy sources to power ICT operations and contribute to a more sustainable energy mix.
- Disable switch ports when not in use to prevent unnecessary energy consumption.
- Consider using Power over Ethernet (PoE)-connected smart sensors for additional cost savings.

## Repurpose, Recycle and offset...

- Collaborate with manufacturers, vendors, and third parties to repair and extend the lifespan of devices, allowing them to find new purposes beyond the enterprise environment. This approach promotes resource efficiency and reduces electronic waste.
- Implement comprehensive recycling and waste reduction programs to ensure the responsible disposal of electronic waste. By doing so, you can minimize the environmental impact associated with the disposal process.
- Establish partnerships with nonprofit organizations that specialize in distributing devices, such as laptops, to lower-income individuals or other organizations in need. This enables you to contribute to digital inclusion efforts while also reducing electronic waste.
- Work with certified electronics recyclers who adhere to high environmental standards and possess the expertise to safely manage used electronics. This ensures that the recycling process is conducted in an environmentally responsible manner.
- If all other options have been exhausted, consider offsetting unavoidable emissions. This involves investing in initiatives that reduce greenhouse gas emissions or remove carbon dioxide from the atmosphere, thereby balancing out the environmental impact of your operations.

## 3

## Improve your strategy

- Raise awareness and educate staff: Conduct training and awareness programs to educate employees about the environmental impact of technology, ICT processes, and communication. By increasing knowledge and understanding, you can foster a culture of sustainability within your organization.
- Communicate efforts and increase transparency: Share information about your sustainability initiatives and progress with both internal and external stakeholders. By communicating your efforts, you can inspire others and demonstrate your commitment to sustainable practices.
- Sustainable procurement: Incorporate sustainability criteria into your procurement processes. Prioritize suppliers and vendors that offer environmentally friendly products and services. Assess the environmental impact of the entire product lifecycle, including resource usage, manufacturing processes, and end-of-life disposal.
- Embrace greener technologies: Adopt energy-efficient devices, servers, and networking equipment that align with sustainable ICT practices. Investing in greener technologies significantly reduces energy consumption and minimizes the overall environmental impact of your ICT operations.
- Monitor waste reduction rates: Track and measure the reduction in waste generated from your ICT operations. This monitoring helps you assess the effectiveness of waste reduction initiatives and identify areas for further improvement.
- Assess energy and cost savings: Evaluate the energy and cost savings achieved through sustainable practices. This assessment allows you to quantify the benefits and advantages of adopting sustainable ICT procedures.
- Seek public-private collaborations: Explore opportunities for collaboration between your organization and public or private entities to enhance sustainable ICT practices. By working together, you can leverage shared resources and expertise to drive positive change.
- Make digital content accessible: Ensure that your digital content is accessible to impaired individuals. Employ accessible UX design principles to make your website usable and enable visitors to find the material or functions they need more efficiently.
- Use adaptive images and videos: Optimize your visuals by utilizing adaptive images and videos. Employ various tools and services to reduce the weight of your visuals, which improves the loading speed of your webpages.
- Compress content: Enhance the performance of your website by compressing your content. Utilize tools and services that can help you compress your content, further improving the loading speed and user experience.





EU Ecolabel: A voluntary scheme promoting environmentally excellent goods and services based on standardized processes and scientific evidence.



ENERGY STAR®: An US government-backed symbol for energy efficiency, offering reliable and unbiased information to guide consumer and business decisions.

EPEAT: A leading global ecolabel for technology products and services, managed by the Global Electronics Council (GEC) and meeting ISO 14024 requirements.

TCO Certified: The world-leading sustainability certification for IT products, featuring comprehensive criteria, independent verification, and a system for continuous improvement.

Blue Angel: The ecolabel of the German federal government, providing guidance for environmentally conscious purchasing and promoting ecological product innovations.

WEEE symbol: Indicates that a product should be sent to separate collection facilities for recovery and recycling instead of being discarded as unsorted waste.

## 4

## Familiarize Yourself with IT Labels

The European Commission's Directorate General for Energy initiated a specific study in 2016, as part of the Ecodesign Working Plan, to explore the best approach for enhancing energy efficiency and circular economy aspects of ICT products. This study is on the process of being developed.



## Case studies and best practices in partner countries

The implementation of sustainable ICT practices is commonly implemented in Italy, Denmark and Austria.

**Green Data Centers:** building energy-efficient data centers allow to incorporate renewable energy sources, waste heat recovery systems, and advanced cooling technologies to minimize environmental impact and reduce energy consumption.

**Smart Grids and Energy Management Systems:** smart grid technologies and energy management systems optimize energy usage and minimize waste. These systems enable real-time monitoring and control of energy consumption, facilitating efficient resource allocation and reducing overall energy demand.

**E-Mobility Initiatives:** promoting electric mobility by investing in charging infrastructure and providing incentives for electric vehicle adoption. including the development of smart charging networks and mobile applications help users locate charging stations and plan their routes efficiently.

**Digitalization for Energy Efficiency:** energy management platforms and smart metering systems enable real-time monitoring and analysis of energy consumption patterns, facilitating informed decision-making for reducing energy waste.

**Teleworking and Video Conferencing:** To reduce carbon emissions associated with transportation, companies and public institutions should adopt teleworking and video conferencing as sustainable alternatives. This shift towards remote work reduces commuting-related emissions and promotes a more sustainable work culture.



**Telecom Italia's Sustainability Initiatives:** Telecom Italia, one of Italy's leading telecommunications companies, has implemented several sustainable ICT practices. They have focused on reducing energy consumption in their data centers, promoting teleworking to reduce commuting, and implementing smart metering technologies for energy efficiency.. <https://www.gruppotim.it/en/sustainability/environment/environmental-strategy.html>

**ENI's Green Data Center:** ENI, an Italian multinational oil and gas company, has established a green data center to reduce energy consumption and improve environmental sustainability. They have utilized innovative cooling systems, energy-efficient servers, and virtualization technologies to optimize resource utilization and reduce carbon emissions. Examining ENI's green data center project can offer insights into sustainable ICT practices within the energy sector. <https://www.eni.com/en-IT/operations/green-data-center-ferrera-erbognone.html>

**The City of Milan's Smart City Projects:** Milan, the economic hub of Italy, has implemented several smart city initiatives to enhance sustainability. These projects focus on leveraging ICT solutions for efficient energy management, waste management, and mobility. Exploring Milan's smart city initiatives would provide valuable examples of sustainable ICT practices at a city-wide scale. <https://smart-cities-marketplace.ec.europa.eu/projects-and-sites/projects/sharing-cities/sharing-cities-site-milan>

**University of Bologna's ICT Sustainability Initiatives:** The University of Bologna has undertaken various ICT sustainability initiatives to reduce its environmental footprint. They have implemented energy-efficient data centers, promoted virtual collaboration tools to reduce travel, and optimized IT asset management practices. Exploring the University of Bologna's sustainability reports and ICT initiatives can offer insights into sustainable practices in the education sector. <https://www.unibo.it/en/university-and-society/sustainability>

**Leonardo's Green IT Strategy:** Leonardo, an Italian aerospace and defense company, has implemented a comprehensive Green IT strategy to reduce energy consumption and environmental impact <https://www.leonardo.com/en/news-and-stories-detail/-/detail/leonardo-sustainability-in-action>

**Sustainable Vienna 2030:** The city of Vienna has launched the Sustainable Vienna 2030 initiative, which includes various ICT projects aimed at promoting sustainability. This includes implementing smart city solutions, optimizing energy management, and utilizing digital technologies to enhance environmental monitoring and resource efficiency.

<https://www.wien.gv.at/stadtentwicklung/studien/pdf/b008384a.pdf>

**Green Energy for Data Centers:** SOME data centers in Austria have implemented sustainable practices to minimize their environmental impact. For example, the Graz University of Technology operates a green data center powered by renewable energy sources such as solar and wind. The data center also incorporates energy-efficient cooling systems and waste heat recovery technologies.

[https://www.tugraz.at/en/tu-graz/services/news-stories/tu-graz-](https://www.tugraz.at/en/tu-graz/services/news-stories/tu-graz-news/singleview/article/data-house-neuer-innovationscluster-am-campus-der-tu-graz)

[news/singleview/article/data-house-neuer-innovationscluster-am-campus-der-tu-graz](https://www.tugraz.at/en/tu-graz/services/news-stories/tu-graz-news/singleview/article/data-house-neuer-innovationscluster-am-campus-der-tu-graz)

**The online platform „Sustainable Development“** provides communication and information transmission in the context of Research and Technology Programs in the area of Renewable Energy and Environmental Technologies. It is a service from the Austrian Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK). <https://nachhaltigwirtschaften.at/en/>

**The Austrian Ecolabel for Products** was created on the initiative of the Federal Ministry of and provides the general public with information on the environmental impact of consumer goods that arises from their production, usage and disposal and attracts the attention of consumers to alternative environmentally friendly products. The products and/or services for which guidelines have been drafted are subject to a holistic evaluation. In this context not only the environmental effects of the use of a product or a service but also the production process, disposal as well quality and fitness for use ("lifecycle") are recorded. The following points can be considered to be the basis for evaluating the environmental compatibility of products like Consumption of raw materials and energy <https://www.umweltzeichen.at/en/products/start>





Some companies that in Denmark are already implementing ICT sustainability policies are:

**A.P. Moller - Maersk:** Maersk, a Danish multinational shipping company, has implemented various green computing practices. They have optimized their data centers for energy efficiency, utilizing virtualization and advanced cooling systems. Maersk also focuses on responsible e-waste management and participates in initiatives for recycling and reusing electronic equipment. Maersk Line has announced that it will operate the world's first carbon-neutral cargo vessel by 2023. The plan is to operate the vessel on carbon neutral e-methanol, which is produced by using renewable sources such as biomass and solar energy, or sustainable bio-methanol <https://www.maersk.com/news/articles/2022/01/12/apmm-accelerates-net-zero-emission-targets-to-2040-and-sets-milestone-2030-targets>

**Danske Bank:** Danske Bank, one of Denmark's largest financial institutions, has prioritized sustainability in its IT operations. They have consolidated and virtualized their server infrastructure, leading to reduced energy consumption and a smaller carbon footprint. Danske Bank also actively promotes energy efficiency measures and responsible disposal of electronic waste. <https://danskebank.com/sustainability>

**Novozymes:** Novozymes, a Danish biotechnology company, has incorporated green computing practices into their operations. They have implemented server virtualization and consolidation, reducing the number of physical servers and improving energy efficiency. Novozymes also focuses on optimizing cooling systems and ensuring proper recycling of electronic waste. <https://www.novozymes.com/en/sustainability/how-we-perform>

**Vestas:** Vestas, a Danish wind turbine manufacturer, has integrated green computing practices into their IT infrastructure. They utilize energy-efficient hardware and implement server virtualization to minimize energy consumption. Vestas also emphasizes responsible e-waste management and collaborates with recycling partners to ensure the proper disposal of electronic equipment. Vestas Corporate Sustainability Strategy, which sets environmental commitments for: CO2 reduction in line with the Science Based Target initiative by 2030; and zero-waste wind turbines by 2040. <https://www.vestas.com/en/sustainability/environment/carbon-footprint>