

Green Digital

Improving the environmental sustainability of ICTs in companies

Workshops

Use Cases

Green Digital - Improving the environmental sustainability of ICTs in companies

R2 – Green Digital Workshops – Case Studies

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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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Introduction

This document has been created by the Green Digital project to support the implementation of the Green Digital Workshops, training sessions delivered to workers and managers on the topic of ICT sustainability for companies.

The workshops aimed at transferring knowledge, skills and competences to workers and managers in order to implement processes for sustainable implementation and use of ICTs. These Case Studies have been created to provide examples and ideas to create your own ICT sustainability plan.

You can use this document in combination to all the Green Digital products We strongly recommend you to check and download the Green Digital Toolkit on the project website www.greendigital-project.eu.

Case 1

Background:

TCO Company is a small IT services provider with a commitment to sustainability. They want to **measure the energy consumption of their ICT devices** to assess their environmental impact and identify opportunities for improvement. They have never measured before and their offices consist of 25 employees.

1. Define the Scope and goal Target: (The smaller the better)

Measure energy consumption of ICT Devices at the office over a period of 1 year.

Option A: Metered electricity consumption

Step 1: Make an Inventory to Identify ICT Devices

Begin by creating a list of all ICT devices used within the company. This includes computers, laptops, monitors, servers, networking equipment, printers and any other electronic devices.

Categorize these devices based on their function and location within the office.

10 Laptops: [ThinkPad T470](#)

20 Desktops: [Inspiron](#)

8 [corporate phones](#).

20 [All in one Desktop](#)

3 [printers](#)

Step 2: Energy Monitoring Tools

Research and select energy monitoring tools or devices suitable for measuring the energy consumption of different ICT devices. Options may include:

Smart Plugs: These can be attached to individual devices and provide real-time energy consumption data.

Energy Monitoring Software: Install software on computers and servers that tracks their energy usage. (E.g IBM Envizi, CPU-Z, HWMonitor, or PowerTOP)

Watt Meters: Use portable watt meters to measure energy usage of devices that can't be monitored digitally.



Step 3: Device Setup

- Set up and Configure the tools to collect data over a specific period, such as a week or a month. Use a representative sample of ICT devices from each category identified in the first step

Step 4: Data Collection for 1 week up to 1 month

- Allow the energy monitoring tools to collect data on energy consumption. Ensure that the devices are used as they normally would be during this period.
- Record data for each device, or type.

Step 5: Data Analysis (needs to be expand)

- Gather all the data collected by the energy monitoring tools during the specified period.
- Organize the data into categories based on the types of ICT devices (e.g., computers, printers, phones, laptops).
- Calculate the average daily or monthly energy consumption for each type of ICT device. Use the data recorded during the monitoring period.
- Create a table or spreadsheet to present these averages clearly.

Devices	Average Daily Consumption(kWh) per unit	Average Monthly Consumption(kWh) Per unit	Total Devices daily Consumption	Total Devices monthly Consumption
Computer and laptops	0,3 kWh	9 kWh	9 kWh	270 kWh
Printers	0,05 kWh	1,5 kWh	0,15 kWh	4,5 kWh
Phones	0,02 kWh	0,6 kWh	0,16 kWh	4,8 kWh
Total ICT consumption	-	-	9,31 kWh	279,3 kWh

Total ICT Equipment Consumption (Computers, Printers, Phones, and Tablets):

- Total Daily Consumption: 9,31 kWh
- Total Monthly Consumption: 279,3 kWh

Total Yearly Energy Consumption for ICT Equipment:

1. Computers (Desktops and Laptops):

- Total Yearly Consumption: 270 kWh/month * 12 months = 3.240 kWh/year

2. Printers:

- Total Yearly Consumption: 4,5 kWh/month * 12 months = 54 kWh/year

3. Phones:

- Total Yearly Consumption: 4,8 kWh/month * 12 months = 57,6 kWh/year

Total Yearly ICT Equipment Consumption (Computers, Printers, Phones, and Tablets):

- Total Yearly Consumption: 3.240 kWh/year (computers) + 54 kWh/year (printers) + 57,6 kWh/year (phones and tablets) = 3.352,6 kWh/year

- = 3,35 MWh

Identify Energy Consumption Trends

- Variations in energy consumption during peak and off-peak hours.
- Differences in energy usage between weekdays and weekends.
- Seasonal variations in energy consumption.
- Remember that demand fluctuates and other elements such as increasing number of staff, or decreasing, equipment performance and peak and low seasons.
- Identify any devices that consistently show higher energy consumption or unusual patterns.

Cloud Service and Website:

The energy consumption of cloud services and websites can vary significantly based on factors such as server efficiency and usage. It's not possible to estimate this accurately without specific data from the service providers.

Step 6: Report

Prepare a report summarizing the findings from the energy consumption measurements.

- Start with an executive summary that provides a brief overview of the key findings and recommendations.
- Highlight devices or categories with the highest energy consumption and potential areas for improvement.
- Provide specific recommendations for reducing energy consumption based on the analysis.
- Include actionable steps and best practices for optimizing energy usage for different ICT devices.

Option B:

Step 1: Gather Energy Bills

- Collect the energy bills for your small company for a specified period, such as a month or a year. Ensure that the bills provide detailed information on energy consumption.

Step 2: Identify ICT Device Energy Usage

- Examine the energy bills to identify the total energy consumption of the entire office or facility during the specified period.
- Separate out the electricity consumption that can be attributed to ICT devices. This may require some estimation based on known usage patterns and office layouts.

Step 3: Calculate Average Monthly ICT Energy Consumption

- Calculate the average monthly energy consumption specifically related to ICT devices. To do this, divide the total ICT-related energy usage by the number of months in the billing period.
- You can estimate the energy consumption of individual types of ICT devices. For example, if you have data on the number of computers and monitors in your office, you can estimate their combined energy usage.

A quick internet search or review of device user manuals will give you the energy use for specific devices, or you may find any of a number of web-based calculators that will do this calculation for you, such as the kWh Energy Savings Calculator.

Use manufacturer data or online resources to find the average power consumption of common ICT devices and multiply this by the number of devices to estimate their energy consumption. Be sure to account for variations in usage patterns.

On average a laptop use around 60 watts of power while performing normal functions and use up to 120 watts while gaming or using design software's like SolidWorks, Adobe.

Device	Watts
Coffee maker	900–1200
Ceiling fan	65–175
Window fan	55–250
Heater (portable)	750–1500
CPU - awake / asleep	120 / 30 or less
Monitor - awake / asleep	150 / 30 or less
Laptop	50

- <https://letsaveelectricity.com/laptop-power-consumption-calculator/>



(Average daily use: Computer system)

Once you have the wattage of the device, determining how much energy it uses is straightforward arithmetic:

$(\text{Wattage} \times \text{Hours Used Per Day}) \div 1000 = \text{Daily Kilowatt-hour (kWh) consumption}$

Example Calculations (using manufacturer data):

- **Laptops:**

Average power consumption: 60 watts (during normal use)

Assume 6 hours of daily usage

$(60 \text{ watts} \times 6 \text{ hours}) / 1000 = 0,36 \text{ kWh daily consumption}$

Multiply by 250 working days in a year: $0,36 \text{ kWh} \times 250 \text{ days} = 90 \text{ kWh/year}$

- **Desktops:**

Average power consumption: 120 watts (during normal use)

Assume 6 hours of daily usage

$(120 \text{ watts} \times 6 \text{ hours}) / 1000 = 0,72 \text{ kWh daily consumption}$

Multiply by 250 working days in a year: $0,72 \text{ kWh} \times 250 \text{ days} = 180 \text{ kWh/year}$

- **Printers:**

Assume printing for 0,5 hours per week

You can calculate the weekly and monthly consumption based on the wattage of the printer during printing.

Device	Units	Consumption rate theoretical*(watts)	Working days	Device Yearly Consumption(kWh)	Total Yearly Consumption(kWh)
Laptops	10	60	250	90	900
Desktops	20	120	250	180	3600
Printers	3	0,01	250	2,5	7,5
Phones	8	<u>5,45</u>	250	2	16
Total	-	-	-	-	4.523,5

Option c:

Use a online calculator

- [Calculator.net](#)
- [Energy calculator](#)
- [Pays to Live Green.](#)
- [Energy use calculator](#)

Implement easy strategies for reducing energy consumption.

1. Activate Energy Efficiency Settings:

- Enable energy-saving settings on all devices, including computers, monitors, and printers. Set devices to enter sleep or hibernation mode when not in use.

2. Upgrade to ENERGY STAR Equipment:

- Replace outdated office equipment with ENERGY STAR-rated devices. These are designed for efficiency and consume less power during operation.

3. Encourage Efficient Practices:

- Foster a culture of energy efficiency within the organization. Encourage employees to turn off equipment when not in use and optimize power management settings.

4. Investigate Renewable Energy Options:

- Research if your energy provider offers renewable energy options. Switching to renewable sources can power operations sustainably and reduce your carbon footprint.

5. Disable Unused Switch Ports:

- Disable switch ports that are not in use to prevent unnecessary energy consumption in the network.

6. Explore Power over Ethernet (PoE) Sensors:

- Consider utilizing PoE-connected smart sensors to monitor and control energy usage, leading to additional cost savings.

7. Staff Awareness and Education:

- Conduct training and awareness programs to educate employees about the environmental impact of technology and ICT processes. Encourage responsible energy usage.

8. Embrace Greener Technologies:

- Invest in energy-efficient devices, servers, and networking equipment aligned with sustainable ICT practices. These technologies significantly reduce energy consumption and minimize environmental impact.

9. Implement Routine Maintenance and cleaning:

- Establish a maintenance schedule that includes regular inspections of office equipment. Prevent overheating and inefficiencies by keeping devices well-maintained.
- Dust and debris can accumulate inside computers and electronic equipment, causing them to work less efficiently. Regularly clean the interiors and exteriors of devices to prevent dust buildup.

10. Keep Software and Firmware Updated:

- Ensure that software and firmware on computers and peripherals are up to date. Manufacturers often release updates with energy-saving features and performance improvements.

Case 2

Target: Measuring Carbon Footprint

Follow all the steps before and after calculating the total energy consumption, research the emission factor corresponding to your analysis.

Using the previous examples...

Office's Consumption: The office's energy consumption for ICT equipment is 4,52 MWh.

Step 6: Find the impact factor for energy in your location. Use different references databases, such as:

- [IEA](#)
- [EGRID](#)
- [Danish energy agency](#)
- [Emission factor](#)
- Environmental datasets (eg. ecoinvent)
- [The EU ETS](#)

Consult with environmental consultants and/or offsetting companies if possible.

Emission/Impact Factor:

For Denmark the emission factor as 0.3152 mtCO₂/MWh using the GHG protocol.

Calculated Carbon Emissions:

$$4.52 \text{ MWh} \times 0.3152 \text{ mtCO}_2/\text{MWh} = 1.43 \text{ mtCO}_2$$

In comparison a car produces 4.6 metric tons of CO₂ per year. This assumes the average gasoline vehicle on the road today has a fuel economy of about 9,43 Km/l and drives around 18.507,45 Km per year. Meaning the impact of this example office is relatively small compared to other operations. This is normal since we are talking only ICT office devices for a small office and is just a part of the daily operations this office would run, and we are talking about Denmark emission factor which is a country with advance renewable energy grid.

Implement easy strategies for reducing emission.

1. Optimize Energy Efficiency:

- Continue implementing energy-efficient practices from Case 1, such as activating energy-saving settings and using ENERGY STAR-rated equipment. Energy efficiency directly translates to reduced carbon emissions.

2. Renewable Energy Sources:

- Transition to renewable energy sources, such as solar or wind power, for your ICT operations. Using clean energy can significantly reduce carbon emissions associated with electricity consumption.

3. Virtualization and Cloud Services:

- Embrace virtualization and cloud services to consolidate server infrastructure. Cloud providers often use energy-efficient data centers, reducing your carbon footprint.

4. Remote Work Policies:

- Promote remote work policies and video conferencing to reduce the need for employee travel. Fewer commutes mean lower carbon emissions from transportation.(Not directly link to ICT operations)

5. Sustainable Commuting:

- Encourage eco-friendly commuting options, such as biking, walking, carpooling, or using public transportation, for employees who must be on-site.

6. Carbon Offset Programs:

- Consider participating in carbon offset programs to compensate for emissions that cannot be eliminated. Invest in projects like reforestation or renewable energy to offset your carbon footprint.

7. Green Data Centers:

- If you manage your data center, implement green data center practices, such as optimizing cooling systems and using energy-efficient servers and hardware(Recommendation for large ICT operators).

8. Energy Monitoring and Reporting:

- Continuously monitor and report on energy consumption and carbon emissions. Regularly review and refine your sustainability goals based on the data.

9. Collaborative Sustainability Initiatives:

- Partner with suppliers, clients, and other organizations on sustainability initiatives. Collaborative efforts can have a more substantial impact on reducing emissions.

10. Employee Engagement:

- Involve employees in carbon reduction efforts. Educate them about the organization's sustainability goals and encourage their participation.

Case 3

Target: Measuring the Footprint in Data Volume

In today's digital world, every action we take, from capturing photos and sending emails to creating documents and browsing websites, generates and moves data, influencing our financial resources. By 2025, it's [estimated](#) that the world will generate a staggering 463 exabytes of data daily, equivalent to 463 billion gigabytes per day.

Step 1: Define the Scope

Identify Data Sources:

Begin by pinpointing the sources and types of data to include in your assessment of the digital footprint. This encompasses data generated through office activities, server operations, software applications, email communications, cloud storage, and more.

Understanding two key types of data volume is crucial: storage capacity (the amount of data a device or service can store) and data transfer volume (the data movement between different carriers, particularly significant in web-based services). Different businesses may have varying data consumption patterns:

- **Tech Companies:** Tech firms often exhibit high data consumption due to employees using the internet for cloud-based applications, software development, and product testing.
- **Sales Companies:** Sales companies utilize data for various purposes, including email communication, customer relationship management (CRM) systems, and market research.
- **Customer Service Companies:** Customer service organizations rely on data for customer interactions, ticket management, and monitoring customer satisfaction.

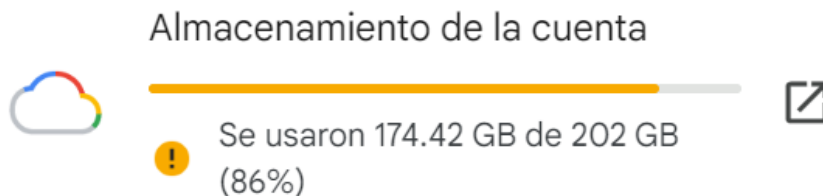
Step 2: Gather Data

1. **Data Volume Records:** Collect data volume records by tracking the data produced, stored, and transferred by the company's digital activities over the specified time period. Sources for this data may include IT logs, cloud service providers, email servers, and data storage systems.

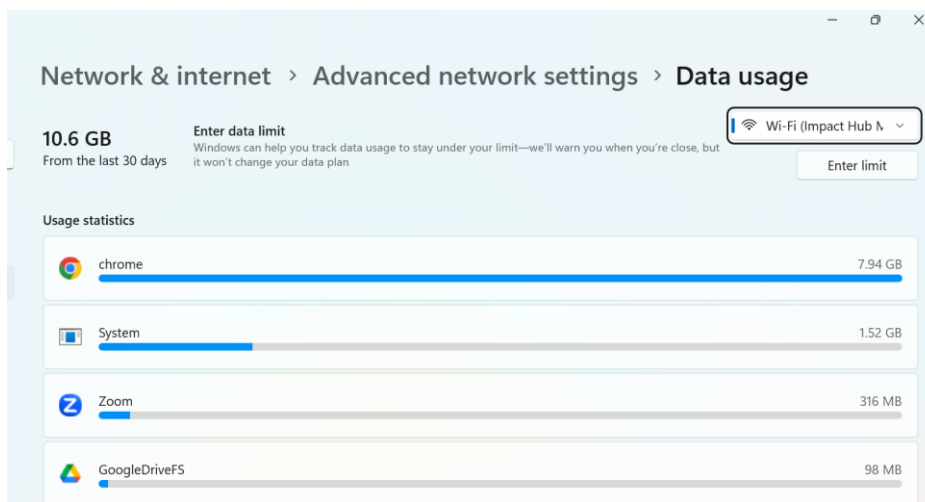
Considerations should also be given to data backup practices, including the number of backup copies created, the storage capacity of devices, data retention periods, and accessibility.

Google One

Como parte de Google One, obtienes más almacenamiento, asistencia de expertos y mucho más



(Storage volume, obtained from google admin)



(Network volume data transfer, obtained from Operative system)

If you are unsure how much data your company is using, you can contact your internet service provider (ISP) for more information. Many ISPs offer tools that can help you track your data usage and identify areas where you can reduce your consumption.

Step 3: Calculate the Digital Footprint (Data Volume)

1. Data Volume Calculation: Calculate the total data volume by aggregating the data produced, stored, and transferred in gigabytes (GB) over the specified period. For example (we are using approximated values from the images before):
 - Storage/year = 150 GB

- Average Network Consumption = 15 GB x 12 months = 180 GB/year
- Average Mobile Network Consumption = 15 GB/month = 180 GB/year
- Total Consumption = 510 GB/year

It's important to note that data consumption varies based on factors such as business type, employee roles, and data usage policies.

Implement easy strategies for reducing data volume.

1. Email Management:

- Minimize waste associated with unsolicited emails and text spam by avoiding sending, receiving, and storing unnecessary messages.
- Implement spam filters to reduce the stream of unsolicited emails and prevent them from cluttering inboxes.

2. Contact List Maintenance:

- Maintain a clean contact list to ensure that messages are sent only to interested recipients. Offer easy unsubscribe options to minimize unwanted communications.

3. Content Compression:

- Enhance your website's performance by compressing content. Utilize tools and services to optimize content, improving loading speed and user experience.

4. Segmented Lists:

- Use segmented lists to tailor messages, reducing the number of emails sent and targeting recipients more effectively. This minimizes data volume and increases engagement.

5. Data Storage Optimization:

- Optimize data storage and cloud usage by identifying which data needs immediate access and which can be stored on long-term storage mediums that require less frequent access.

6. Streamlining Media Consumption:

- Minimize streaming time within the office environment to reduce data consumption. Encourage employees to download content for offline use when possible.

7. Lightweight Web Development:

- Design and develop lightweight, flexible, and quick-loading websites and applications. Faster loading speeds not only enhance user experience but also lead to reduced energy consumption.

8. Implement Data Retention Policies:

- Create and enforce data retention policies that specify how long different types of data should be kept. Regularly purge or archive data that is no longer needed, reducing storage requirements.

9. Prioritize Data Backup and Archiving:

- Distinguish between critical data that requires frequent backups and archival data that can be stored less frequently. This reduces the data volume in active systems and cloud storage.

10. Use Efficient File Formats:

- Encourage the use of efficient file formats for documents, images, and videos. For example, use compressed formats like JPEG for images to reduce file sizes and data transfer requirements.