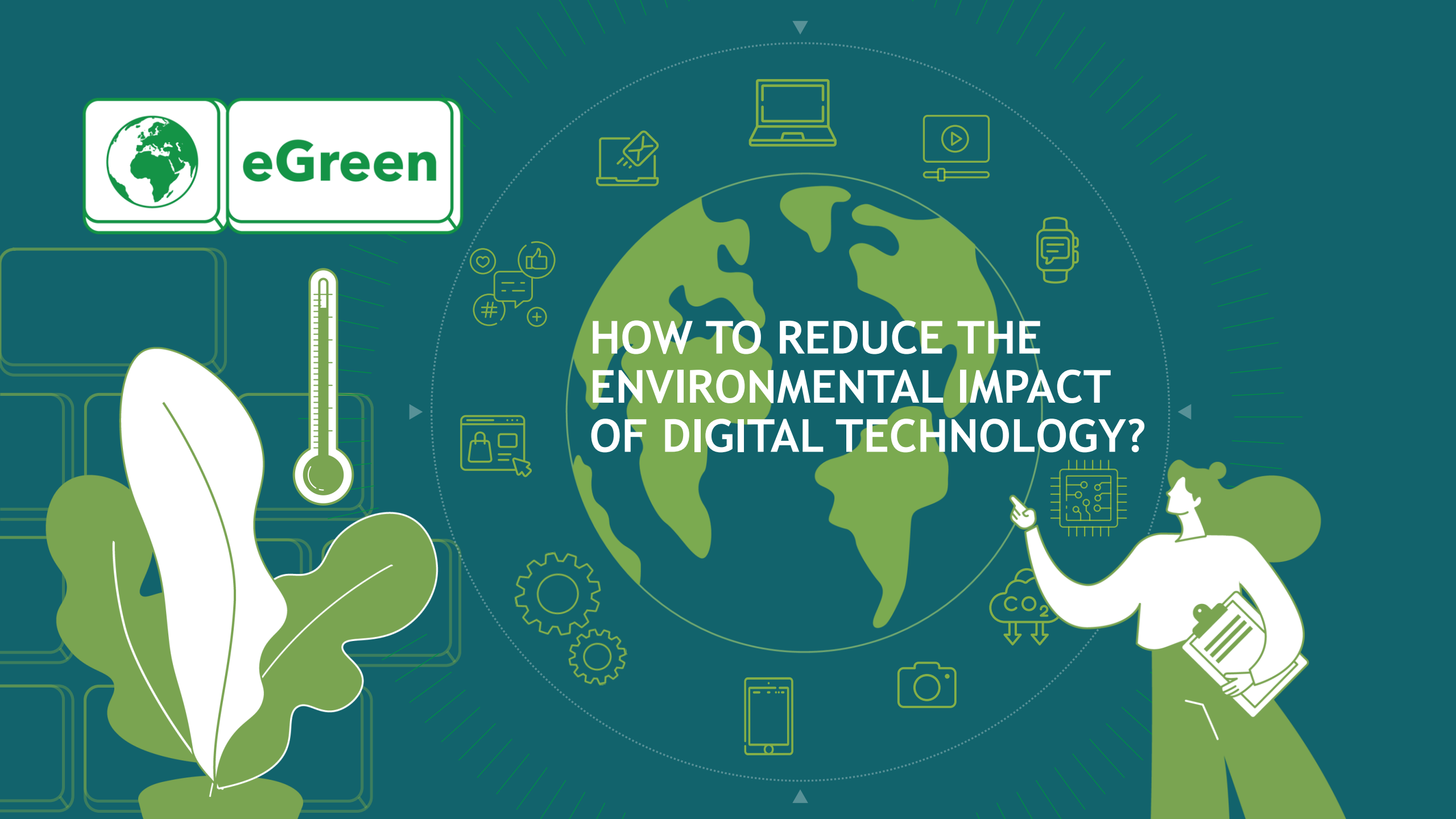




HOW TO REDUCE THE ENVIRONMENTAL IMPACT OF DIGITAL TECHNOLOGY?



OUTLINE OF THE TRAINING



Introduction
to key concepts



Production of
digital devices



Daily usage



End-of-life



The future of digital technology
- initiatives and actions



eGreen

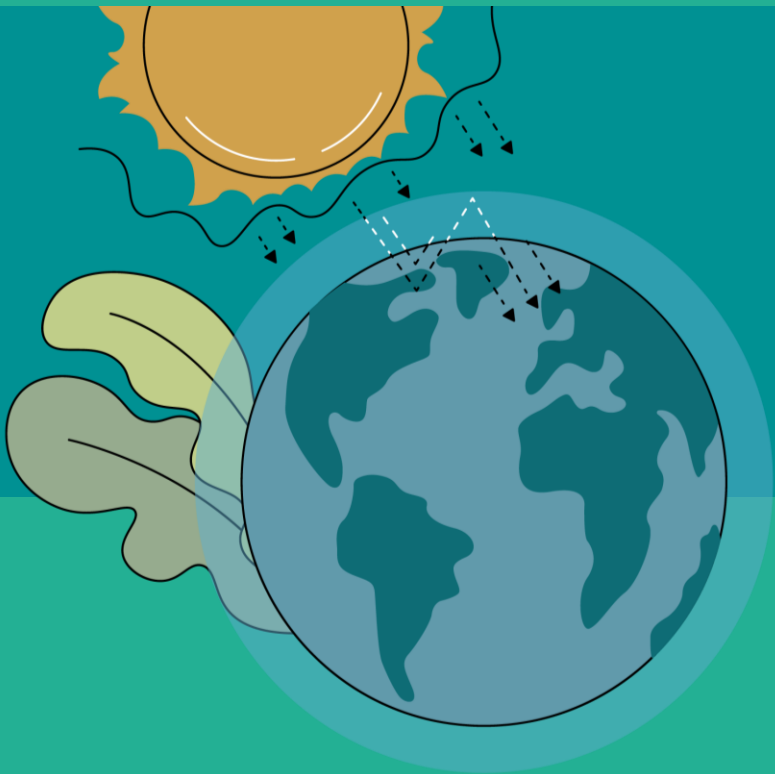
01

INTRODUCTION TO KEY CONCEPTS

Climate change & carbon footprint
Lifecycle of digital devices



CLIMATE CHANGE



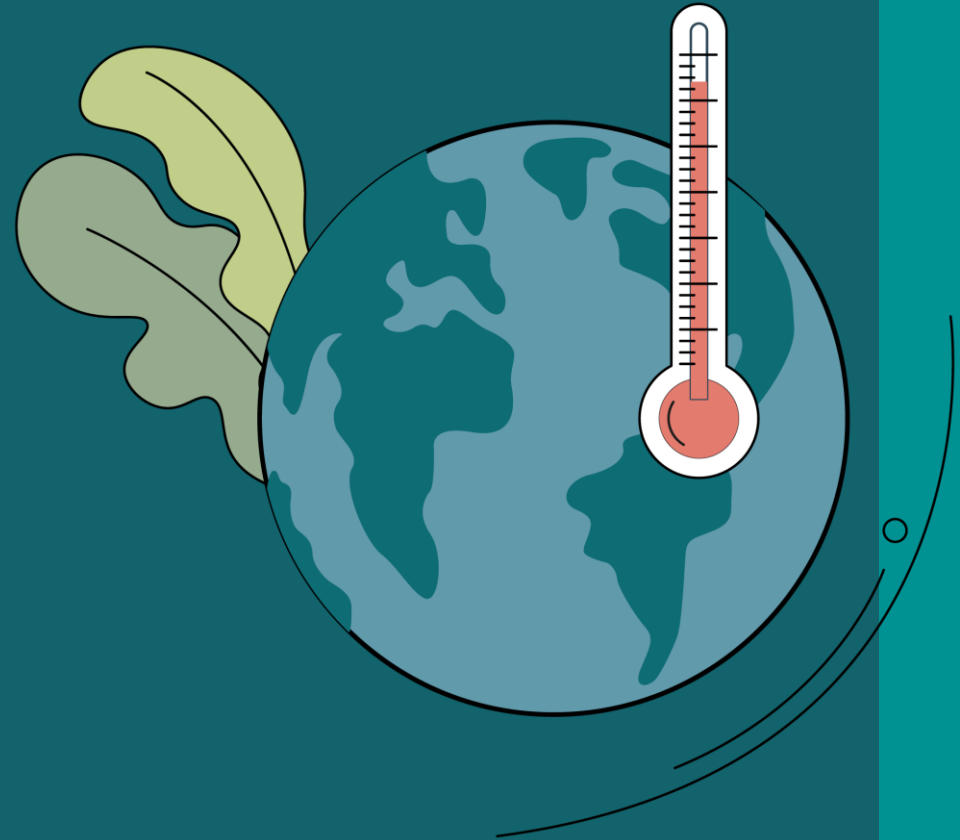
CLIMATE CHANGE
= long-term variations in temperature



GLOBAL WARMING
= rise in temperature

ENVIRONMENTAL IMPACT

CLIMATE CHANGE



Generating power

Deforestation

Production of food



Consumption



Manufacturing goods



Transportation



Powering buildings



Creation of waste





HOW TO MEASURE CLIMATE CHANGE? (A.1)

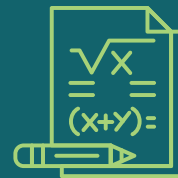


- ▶ What is the most widely used measure for assessing climate change?



CARBON FOOTPRINT

- ▶ What formula is used to obtain it?



CO2 EMISSIONS

=

QUANTITY CONSUMED

X

EMISSION FACTOR



I TRAVEL FROM PARIS TO ROME



CARBON FOOTPRINT

=

ACTIVITY

X

EMISSION RATE



PARIS



1100 km

0,2 of CO2 per km

220 kg of CO2



ROMA



I TRAVEL FROM PARIS TO ROME

CARBON FOOTPRINT

=

ACTIVITY

X

EMISSION RATE



PLANE 1100 km 0,2 of CO2 per km

220 kg of CO2e



CAR 1400 km 0,12 of CO2 per km

168 kg of CO2e



BUS 1500 km 0,06 of CO2 per km

90 kg of CO2e



TRAIN 1400 km 0,05 of CO2 per km

70 kg of CO2e



I EAT EVERY DAY 100 GR DURING 1 YEAR

CARBON FOOTPRINT

=

ACTIVITY

X

EMISSION RATE



BEEF 365 day 1.33 kg CO2e/day

485.45 kg of CO2e

RICE 365 day 0,27 kg CO2e/day

98.55 kg of CO2e

CARROT 365 day 0,014 kg CO2e/day

5,11 kg of CO2e



WHAT IS THE CARBON FOOTPRINT OF THE DIGITAL SECTOR? (A.2)



- ▶ What is the percentage of the digital carbon footprint in global CO₂ emissions?

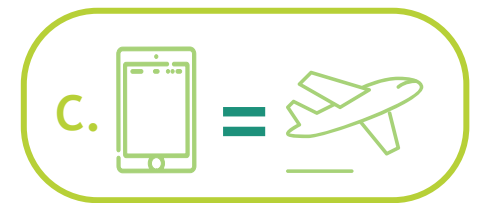
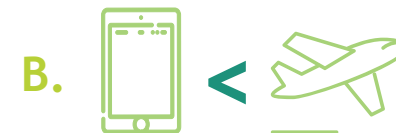
A. 0.05%-0.1%

B. 0.5%-1%

C. 1%-2%

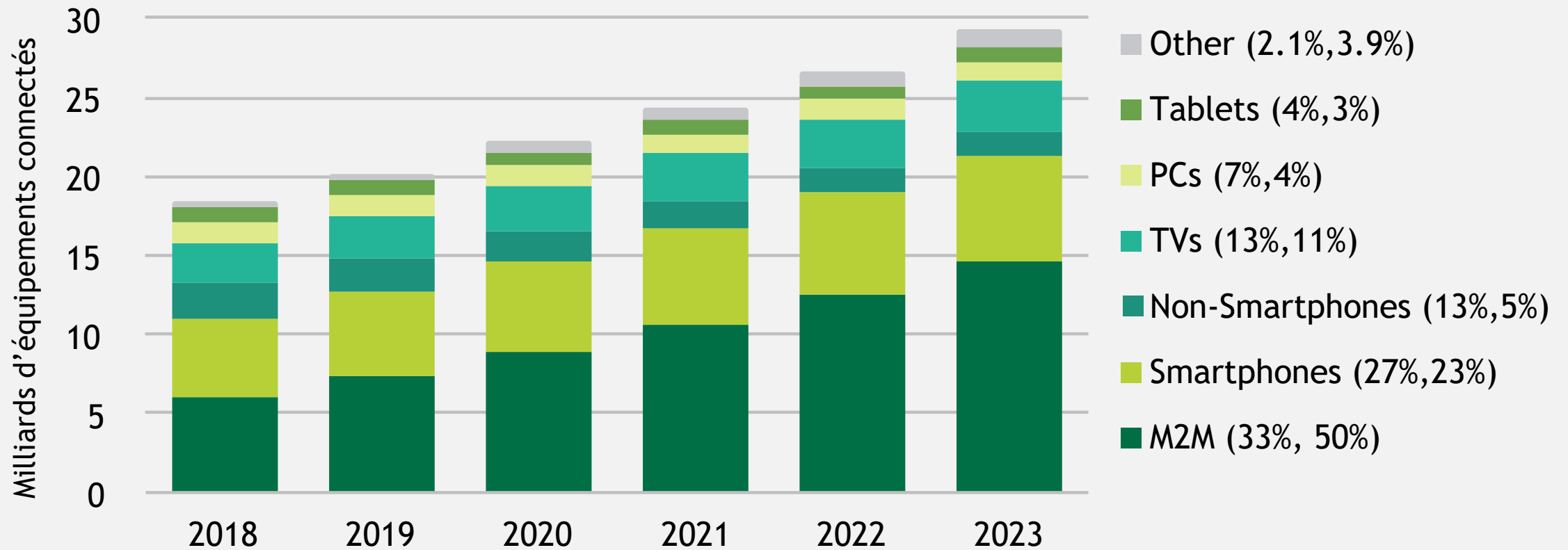
D. 2%-3%

- ▶ When comparing the CO₂ emissions from digital activities and aviation on a global level, which statement best describes their relative contributions?

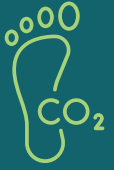




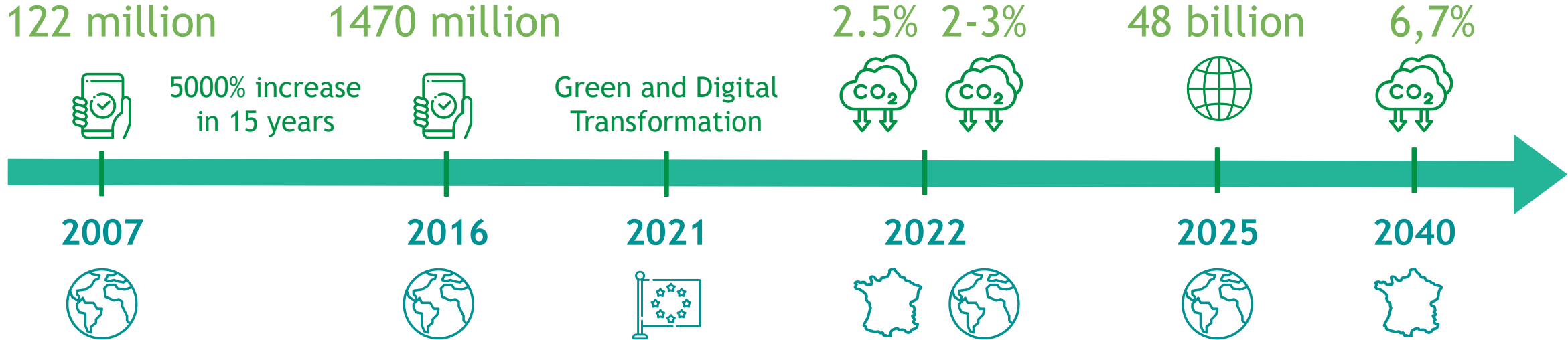
MOST USED DIGITAL DEVICES IN 2023



Source: [Cisco Annual Internet Report, 2018–2023](#)



A GROWING IMPACT OF DIGITAL CARBON FOOTPRINT



62.5 million tons extracted

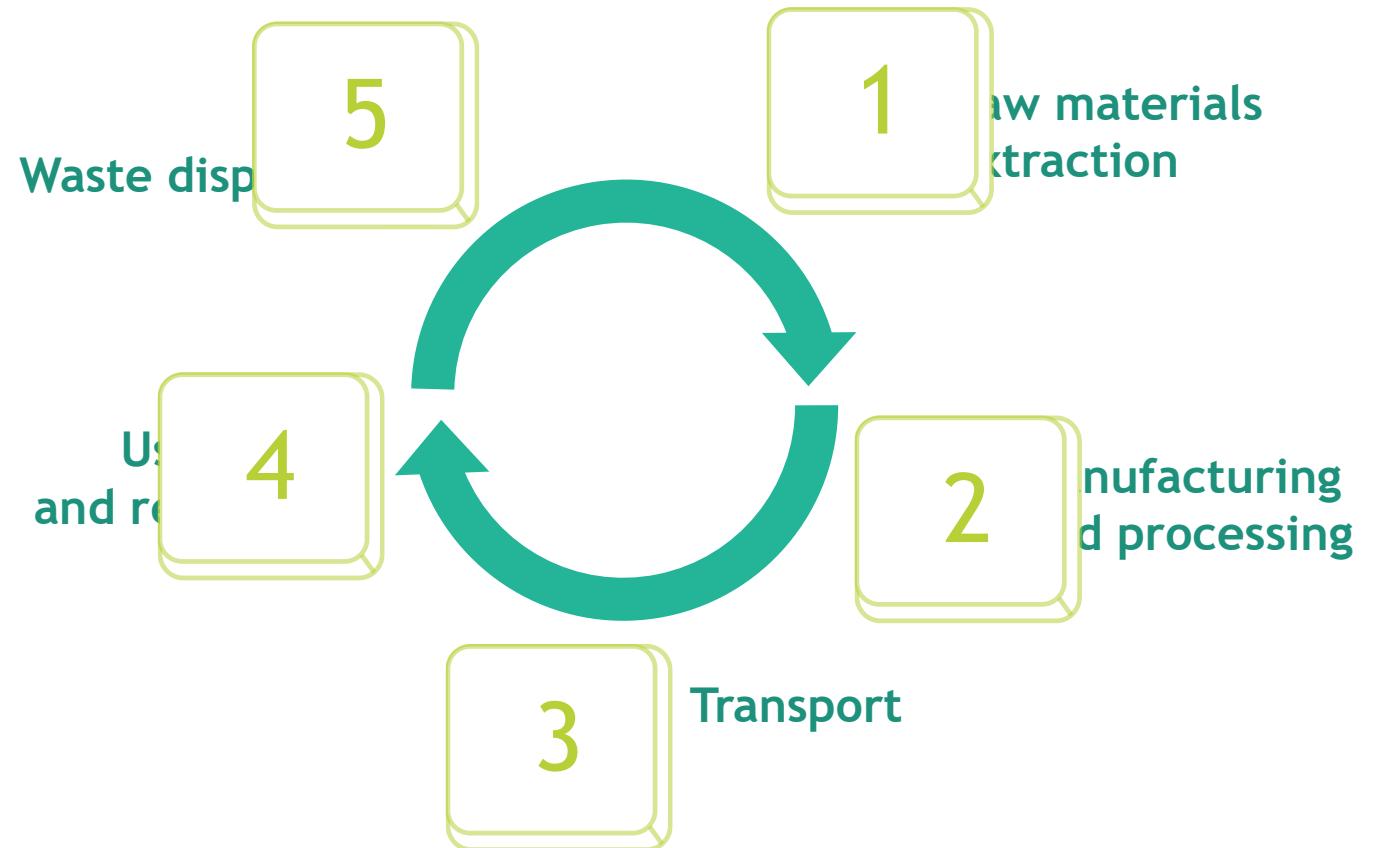


20 millions of non-recyclable waste per year



THE LIFECYCLE OF DIGITAL DEVICES (A.3)

- ▶ What are the 5 stages in the life cycle of a digital device ?





THE LIFECYCLE OF DIGITAL DEVICES (A.3)



- ▶ How much of total CO2 is going to production, use and recycling (in %)?



PRODUCTION



USAGE



WASTE DISPOSAL

78%

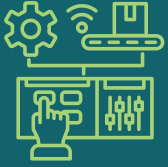
21%

1%



PRODUCTION OF DIGITAL DEVICES

The impact of production

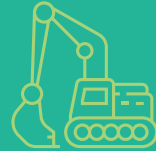


STAGES TO PRODUCE A DIGITAL DEVICE



CONCEPTION

+/- 70 raw materials

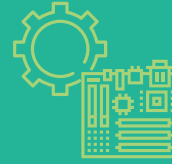


EXTRACTION AND TRANSFORMATION

200 kg excavated
Only a few grams used



Multiple chemical treatments and purification methods



MANUFACTURE OF COMPONENTS

180 steps to build electronic components



CONSTRUCTION

100 x more gold in a ton of smartphone than in a ton of gold minerals



DISTRIBUTION

4 world tours by plane

United States



South-East Asia,
Australia, Central
Africa, South America



Asia, Europe,
United States



South-East Asia



GEOPOLITICAL AND SOCIAL IMPACT



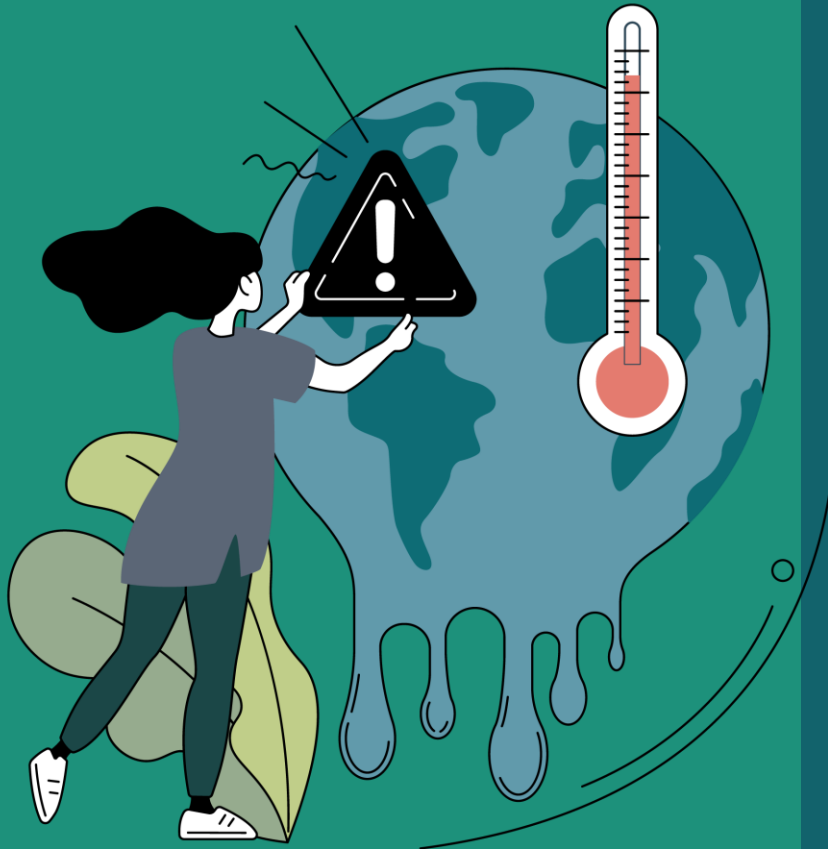
By 2040, global demand multiplied **by 4x**

From 1970 to 2008, **50+** of the global armed conflicts were related to high-value natural resources.

3 of the most violent wars of the 21st century in Africa were related to extractive industries

Democratic Republic of Congo ranks among the least developed country in the African continent

ENVIRONMENTAL IMPACT





Exhaustion of natural resources



Toxic rejects in the wild (air, water, soil)



Carbon emissions to manufacture and assemble digital devices

Manufacturing  =  1,600 km

Intensive water consumption





CARBON FOOTPRINT OF THE PRODUCTION OF MY DIGITAL DEVICES (A.4)

► How many digital devices do you own today ?

Digital device	Number
Smartphone	
Tablet	
Laptop	
Desktop	
Gaming consoles and virtual reality headset	
TVs and streaming devices	
Wearable and smart home devices (speaker, smartwatch...)	
Other (to add)	
TOTAL	



CARBON FOOTPRINT OF THE PRODUCTION OF MY DIGITAL DEVICES (A.4)

Digital device	Carbon footprint of their production	Number of devices	Calculate your footprint
Smartphone	39,07 kg CO2e		
Tablet	63,19 kg CO2e		
Laptop	156,24 kg CO2e		
Desktop	417 kg CO2e		
Gaming consoles and virtual reality headset	73,75 kg CO2e		
TVs and streaming devices	371,69 kg CO2e		
Wearable and smart home devices (speaker, smartwatch...)	10 kg CO2e		
Other (to add)			
TOTAL			



IMPACT ON THE ENVIRONMENT



Greenhouse gas emissions will rise by **6%** every year



Producing digital devices comes up against the limits of our planet: use of non-renewable resources



Demand for metal is exploding: **6%** of the gold used globally is used for the digital sector

Production of a digital device



=



78% if its carbon footprint

SUGGESTIONS TO REDUCE YOUR IMPACT



Buy a device with a high repairability index



Buy second-hand devices



Maximise the lifespan of a digital device



Choose repair over purchase



Buy devices only when necessary



5 THINGS TO CONSIDER BEFORE BUYING ANY DEVICE



NEED



IMMEDIATE



SIMILAR



ORIGIN



USEFUL





DAILY USAGE OF DIGITAL DEVICES

The integration of digital devices
How to use digital devices

DIGITAL DEVICES OWNERSHIP OF INTERNET USERS



► Most owned digital devices by internet users:

↳ Smartphone	97.6%	
↳ Laptop/computer	57.7%	
↳ Tablet	30.9%	
↳ Smartwatch	30.1%	
↳ Game console	19.1%	
↳ TV streaming	15.7%	

INTERNET USAGE IN THE WORLD



5.35 billion

internet users

66.2%

world population



Women **63%**

Men **69%**



92% of the population in high income countries have direct access to internet

26% of the population in low income countries have direct access to internet



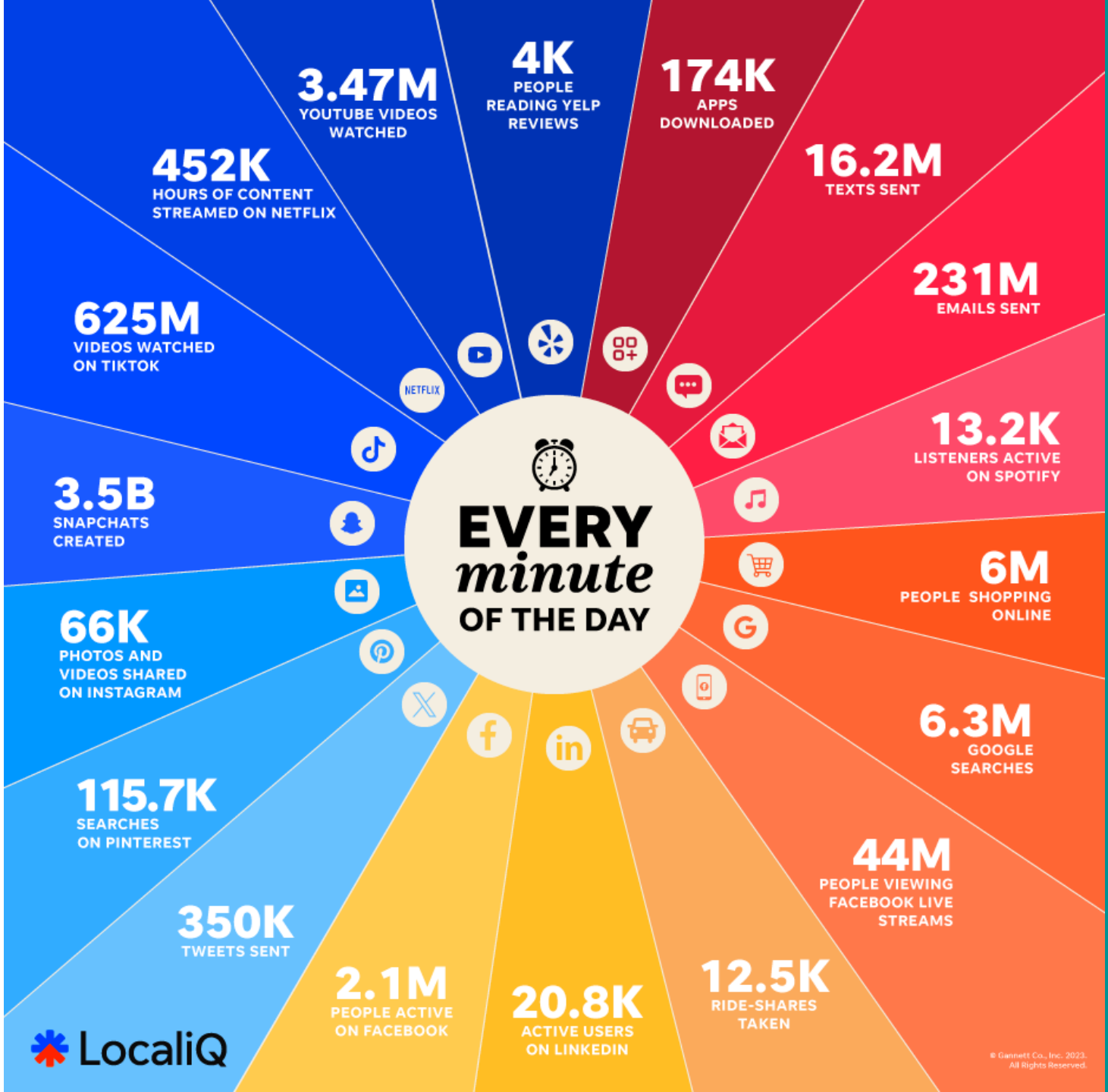
USAGE OF DIGITAL DEVICES (A.5)



► What do digital devices enable us to do?

- ↳  Communication
- ↳  Entertainment
- ↳  Productivity
- ↳  Research and data analysis
- ↳  Learning and information
- ↳  Trade
- ↳  Navigation and location
- ↳  Creativity
- ↳  Health and well-being
- ↳  Safety and security

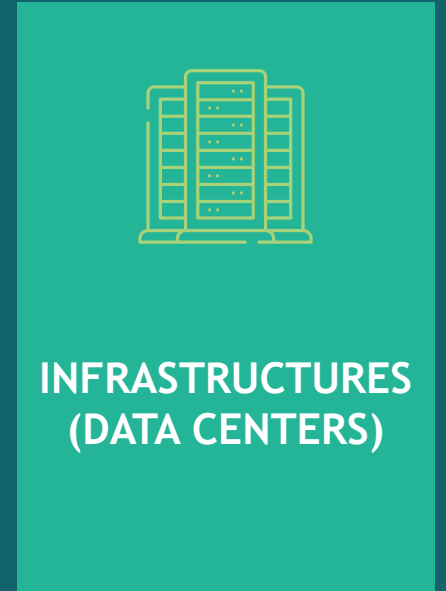
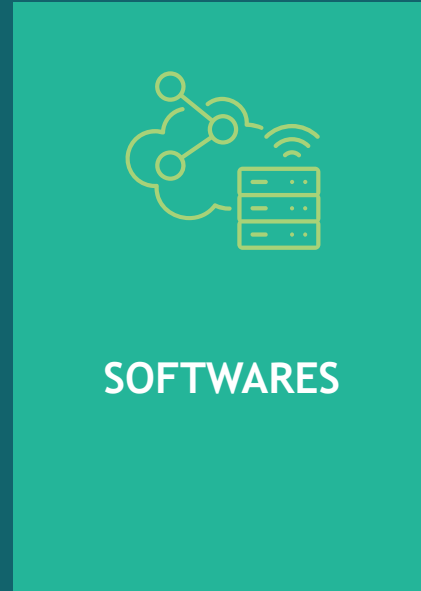
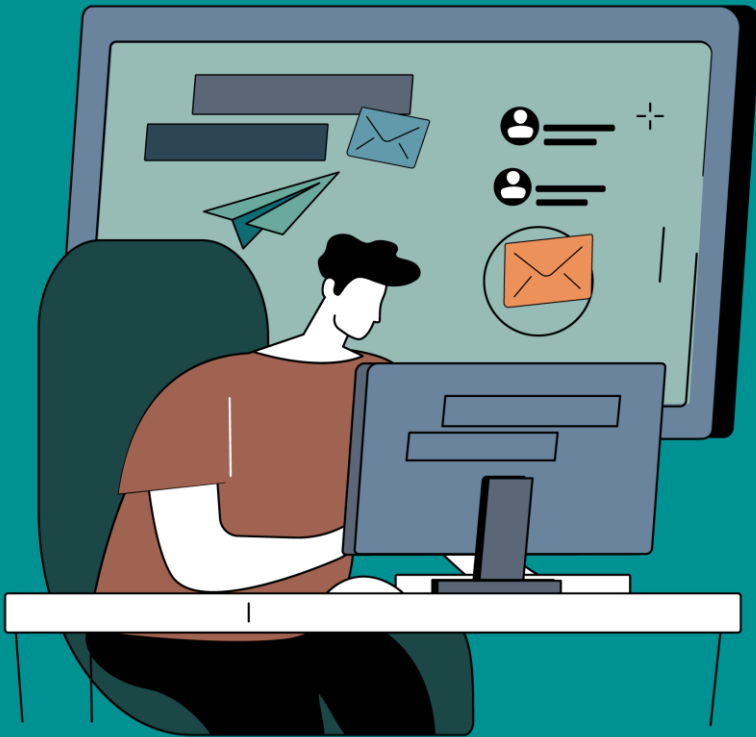




USAGE OF DIGITAL DEVICES

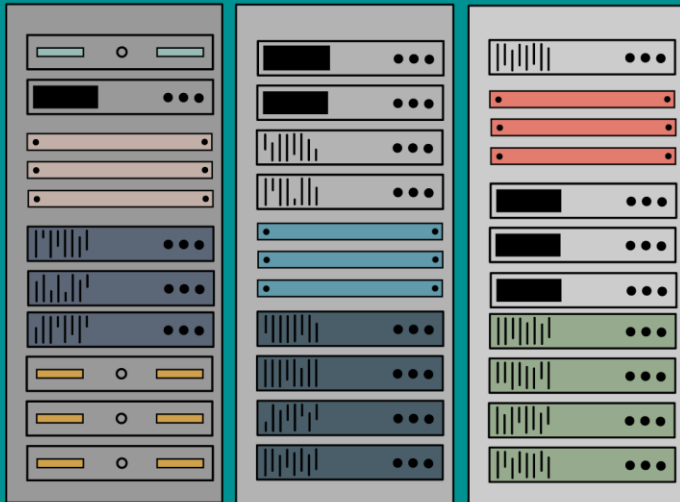
DIGITAL SERVICE

- ▶ All humans, softwares and hardware resources required to provide a service





DATA CENTRES



NETWORK, STORAGE AREAS, COMPUTING SERVERS

► **Process, organise, secure and store data**



Need for electricity 24/7 = **1%**
of the global electricity demand



Cooling systems to prevent malfunction from generated heat



0.3% of all global CO2 emissions



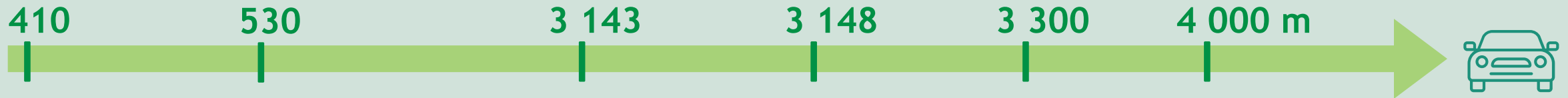
IMPACT OF THE USAGE OF DIGITAL DEVICES (A.6)



► Compare the environmental impact of the digital use to the one of a car

↳ Associate each activity with the distance travelled by a car.

10 m = 1,224 g CO₂



Send and receive 100 emails (without attachments)

Conduct internet research for 1 hour daily for a week

Store a series of 10 one-hour episodes in the cloud

Print 10 double-sided pages

Spend 1 hour on social media daily for a week

Watch a 1 hour episode of a serie daily for a week



DIGITAL HABITS THAT HAVE THE BIGGEST IMPACT



VIDEO STREAMING



80% of internet data

60% online video

20% other

Online video platforms	% of internet data used	% of overall carbon emissions of the digital sector
Streaming platforms (Amazon Prime, Netflix...)	34	7
Adult content platforms	27	5
Host video platforms (Youtube...)	21	4
Social media platforms	18	4



DIGITAL HABITS THAT HAVE THE BIGGEST IMPACT



SOCIAL MEDIA



2h24 = average time spent daily on social media



Shared content, especially videos



149 GB of data consumed when used 52 min daily for a month



2.4 billion users,
645 million tons of CO2/year



350 million shared photos



8 billion videos watched daily

DIGITAL HABITS THAT HAVE THE BIGGEST IMPACT



EMAILS



Sending an email: transits from data centres and travels around **15000 km** around the globe



Carbon footprint of an email
= **4g** of CO₂e (up to 50g with attachments)



293 billion emails send daily (75% spams)
= **90,000 tons** of CO₂e

DIGITAL HABITS THAT HAVE THE BIGGEST IMPACT



INTERNET RESEARCH

Transit through numerous data centres



1 year of internet research



365 kwh of electricity



Travel of **1400 km** by car



GOOD DIGITAL HABITS (A.7)



► Associate each digital habit to its category



1. Video streaming



2. Social media



3. Emails



4. Internet research



I limit the number of open tabs or windows, I close the tab when no longer needed



I use sustainable search engines, such as Ecosia



I reduce my time on social media



I avoid sharing my email if not necessary



I prioritise streaming in lower-quality resolution



I clear my inbox regularly



If I need to go to a page or website address, I enter that address in the address bar and not in the engine bar.



I don't reply to unnecessary emails



If I am searching for a keyword, I use the address bar or the engine bar.



I have scheduled my social media time



I have disabled social media notifications on my devices.



I limit the use of video during online calls



I save the pages I visit often in my favourites to find them directly



I prioritise Wi-Fi, if available, instead of Mobile Data



I use offline mode for my music and videos, if possible



I don't use cc in emails, if not necessary



I have used apps that help limit use of social media on my devices



I have sent emails with links to files instead of large attachments



I don't send unnecessary emails



I have hidden social media apps from the first screen on my devices

SUGGESTIONS TO REDUCE YOUR IMPACT



VIDEO STREAMING



Reduce video quality



Utilise Wi-Fi



Deactivate autoplay



SUGGESTIONS TO REDUCE YOUR IMPACT



SOCIAL MEDIA



Reduce scrolling time



Share less content



Deactivate notifications



SUGGESTIONS TO REDUCE YOUR IMPACT



EMAILS



Delete sent emails and spams



Unsubscribe from newsletters



Limit the transition of large files



SUGGESTIONS TO REDUCE YOUR IMPACT



INTERNET RESEARCH



Navigate directly to desired websites



Use concise keywords



Bookmark frequently visited sites





eGreen

04

END OF THE LIFE OF DIGITAL DEVICES

- Recycling digital devices
- Disposal of digital devices
- Extending the lifespan of digital devices



E-WASTE



► E-Waste = ALL electronic devices (not only digital)

From 2014 to 2019



21% growth of e-waste

2020



Worldwide e-waste



350 cruise ships in a **125 km** line



Neodymium



Indium



Cobalt

LOSS OF VALUABLE MATERIALS

ENVIRONMENTAL IMPACT OF E-WASTE



Non-biodegradable



Toxic rejects in the wild (Air, water, soil)

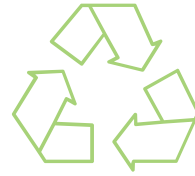


Health issues





RECYCLING E-WASTE



BY 2030, THE E-WASTE INDUSTRY IS EXPECTED TO GROW BY 75 MILLION TONS



17% of e-waste recycled in 2019 in the world



77% of e-waste treated and recycled in france



The us ships **25%** of its e-waste abroad

E-WASTE MANAGEMENT (A.8)



► Scenario:

- ↳ You are cleaning out your room and come across a box of old electronic devices you no longer use.
- ↳ These could include old phones, chargers, headphones, or other gadgets.

What are the different options available for disposing of these e-waste items in your community ?

What challenges might you face in responsibly disposing of your e-waste?



E-WASTE MANAGEMENT

- ▶ Research and utilise available e-waste collection and recycling facilities



Supermarkets



Dedicated stores



Online shops



Recycling does not cover 100% of our needs





EFFECTS THAT ACCENTUATE THE DISPOSAL OF DIGITAL DEVICES (A.9)



► Link the definition with the correct explanation

Functional
obsolescence

Psychological
(or evolutionary) obsolescence

Planned
obsolescence

Irreparability

Strategy through which the standard lifespan of a device is deliberately reduced from the design stage for economic reasons.

Devices that are designed in ways that make them difficult or impossible to be repaired.

When a product no longer meets the needs of users who wish to acquire a new model due to a change in functionality or design.

Product that no longer meets new expectations for technical (e.g. incompatibility with new equipment), regulatory and/or economic reasons.



FUNCTIONAL OBSOLESCENCE

- ▶ Product that no longer meets new expectations for technical (e.g. incompatibility with new equipment), regulatory and/or economic reasons.



Accelerated in the 2000s onward with innovation on smartphones

More than **113 million** smartphone unused in french households

63% of smartphone used are less than 2 years old





PSYCHOLOGICAL OBSOLESCENCE



- ▶ When a product no longer meets the needs of users who wish to acquire a new model due to a change in functionality or design.



Outcome of marketing strategies of tech companies



Creates a sentiment of urgency among customers



PLANNED OBSOLESCENCE



- ▶ A strategy through which the standard lifespan of a device is deliberately reduced from the design stage for economic reasons.



Through software updates



Hardware that is designed not to last (batteries, etc)



IRREPARABILITY

- ▶ Devices that are designed in ways that make them difficult or impossible to be repaired. For instance, soldering major components together to make upgrades and repairs impossible.



Most manufacturers don't provide publicly available replacement options or evolutive solutions. Warranty doesn't cover all repairs.



Sustainable options exist 2021 french reparability index



COUNTERING THESE EFFECTS



2023 EU regulations



Better resistance to drops, dust, water



Availability of operating system upgrades of at least 5 years



Durable battery



Energy label



Repair: essential spare parts available within 5-10 days for up to 7 years



Repairability index



MAINTENANCE OF DIGITAL DEVICES (A.10)

- ▶ How to take care of your digital device to extend its lifetime ?



Smartphone



Laptop/computer



Tablet



Smartwatch



Game console

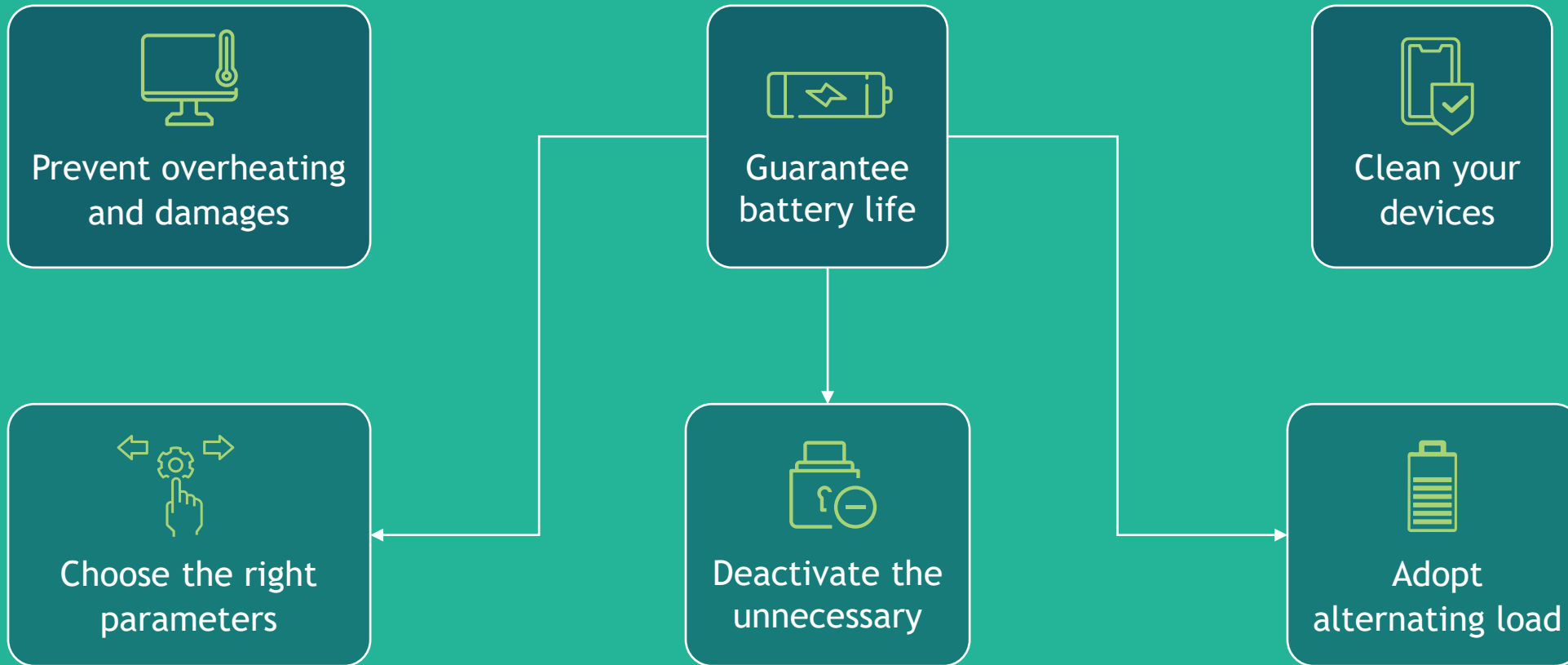


TV





EXTEND THE LIFESPAN OF DIGITAL DEVICES



DISPOSAL OF DIGITAL DEVICES



Dispose of digital devices only when unusable and irreparable



Find recycling options



Upcycle unused devices

SUGGESTIONS TO REDUCE YOUR IMPACT



Preserve devices as long as possible



Repair devices



Buy reconditioned devices



Donate devices



Avoid second screens



Switch off unused devices



Disable notifications, synchronisation, high-resolution streaming



Regularly clear data



Work from home



Guarantee battery life



QUIZZ (A.11)



In 2019, approximately how many smartphones were sold worldwide?

- A. 500 million
- B. 750 million
- C. 1 billion**
- D. 1.5 billion

During the production phase of a digital device, which step requires the excavation of 200 kg of minerals?

- A. Conception
- B. Extraction and transformation**
- C. Manufacture of components
- D. Construction

From production to distribution, how much does a smartphone travel before being sold to the customer?

- A. Equivalent to a round-trip by plane from Brussels to Rome
- B. Equivalent to a round-trip by plane from Paris to Moscow
- C. Equivalent to doing a full world tour by plane
- D. Equivalent to doing 4 world tours by plane**



QUIZZ (A.11)



What percentage does the production phase represent for the overall carbon emission of a digital device ?

- A. 44%
- B. 56%
- C. 68%
- D. 78%**

Which digital activity stands out as the most energy-intensive and environmentally impactful, constituting 80% of web data?

- A. Video streaming**
- B. Social Media usage
- C. Email communication
- D. Internet research

What is the average carbon footprint of the emails sent daily worldwide (calculated without attachments)?

- A. 172 tons of CO₂e
- B. 1172 tons of CO₂e
- C. 110 000 tons of CO₂e
- D. 1.172 million tons of CO₂e**



QUIZZ (A.11)



What percentage of e-waste produced in 2019 reached formal management or recycling facilities, according to the Global E-waste Statistics Partnership (GESP)?

A. 10%

B. 17%

C. 25%

D. 33%

What is psychological obsolescence primarily driven by? (two possible answers)

A. Change in functionality or design

B. Physical wear and tear

C. Consumer perception and desire

D. Marketing strategies

What are some maintenance tips recommended for prolonging the lifespan of digital devices?

A. Regularly cleaning vents and deleting unnecessary data

B. Leaving devices in direct sunlight for better performance

C. Using any type of cleaning solution on screens

D. Allowing devices to overheat occasionally for optimal functioning



THE FUTUR OF DIGITAL TECHNOLOGY - INITIATIVES AND ACTIONS



FUTURE SCENARIOS (BASED TENDENCIAL SCENARIOS FROM 2020)



CARBON FOOTPRINT (in millions of tons)

2020	17.2
2030	25
2050	49.4



RESOURCES USED (in millions of tons)

2020	63.7
2030	88
2050	178



ENERGY CONSUMPTION (in TWh)

2020	52
2030	54
2050	93



CONSUMPTION OF METALS AND MINERALS (in tons)

2020	952
2030	1 081
2050	1 508



DIGITAL MODERATION



- ▶ Approach that aims to reduce the environmental impact of digital technology by limiting its use.
It is one aspect of green digital transformation.



FROM A DIGITAL TO A ENVIRONMENTALLY
CONSCIOUS WORLD



PUBLIC ACTIONS

- Digital education
- Regulations of design techniques
- Information campaigns
- Implementation of sustainable measures in organisations



DIGITAL MODERATION MEASURES (A.12)

Do you ? (1 = No at all / 4 = Very consistently)	1	2	3	4
Keep your digital devices for as long as possible by taking care of them				
Have your phone or computer repaired rather than buying a new one				
Consider buying reconditioned equipment				
Find a second life for unused equipment (by selling, recycling, upcycling, etc)				
Avoid using unnecessary screens				
Do not leave devices on standby				
Use the least data possible				
Clean up your data regularly				
Use digital technology to reduce commuting from home to work / school				
Take care of the battery life of your digital devices				



DIGITAL MODERATION MEASURES (A.12)

Do you intend to ? (1 = No at all / 4 = Very consistently)	1	2	3	4
Keep your digital devices for as long as possible by taking care of them				
Have your phone or computer repaired rather than buying a new one.				
Consider buying reconditioned equipment				
Find a second life for unused equipment (by selling, recycling, upcycling, etc)				
Avoid using unnecessary screens				
Do not leave devices on standby				
Use the least data possible				
Clean up your data regularly				
Use digital technology to reduce commuting from home to work / school				
Take care of the battery life of your digital devices				

INITIATIVES AND ACTIONS



▶ UNEP: Global digital compact



▶ EU Green Deal





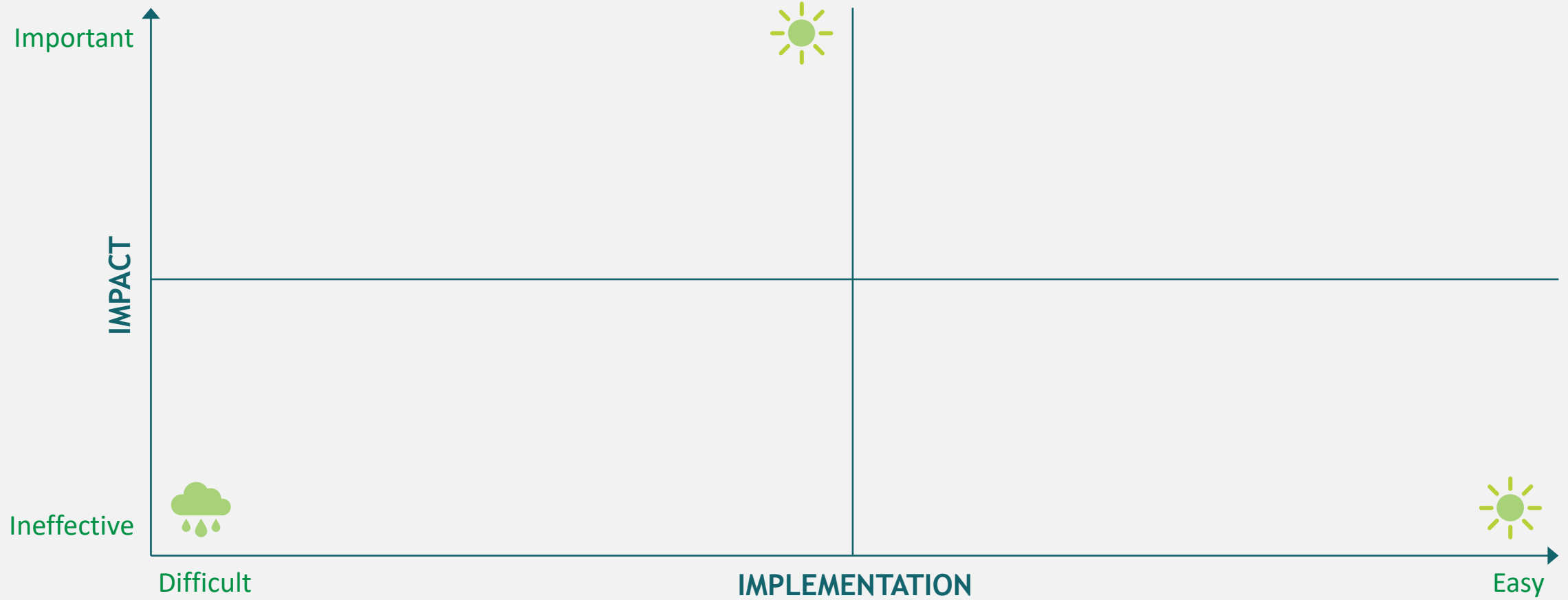
GREEN DIGITAL ACTION PLAN (A.13)



- ▶ Limit the quantity of owned digital devices
- ▶ Adopt a digitally moderate way of life
- ▶ Reduce digital usage
- ▶ Extend the duration of the warranty of a digital device
- ▶ Design sustainable digital infrastructures and devices
- ▶ Repair digital devices
- ▶ Protect and maintain digital equipment
- ▶ Share digital equipments
(ex: internet box shared within a building)
- ▶ Contribute to collective actions
(charity, digital clean up day, initiatives, etc)
- ▶ Regulate production, usage and disposal of digital technology
- ▶ Raise awareness on environmental impact of digital technology in your social circle
- ▶ Improve the longevity and reparability of digital devices (from the design to end-of-life)
- ▶ End software discontinuance
- ▶ Reduce the number of screens and their size
- ▶ Systematically recycle or donate unused equipments
- ▶ Buy second-hand devices
- ▶ Develop new digital technologies



GREEN DIGITAL ACTION PLAN (A.13)





FINAL SUGGESTIONS TO REDUCE YOUR IMPACT



PRODUCTION



Buy only when necessary



Choose repair over buying new



Buy second-hand devices

USAGE



Stream less videos online or stream with lower quality



Limit your time on social media



Clean your email inbox

DISPOSAL



Find recycling options



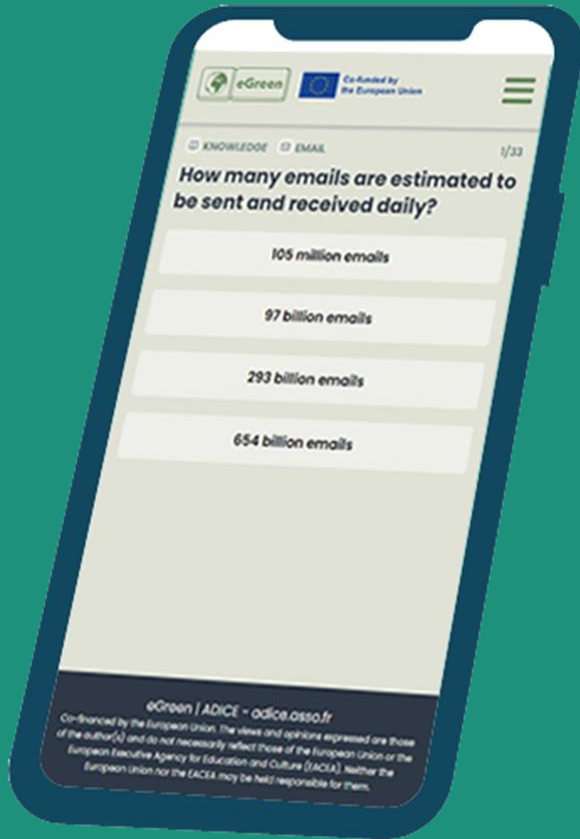
Take precautions to preserve devices as long as possible



Guarantee battery life



WHICH DIGITAL PROFILE ARE YOU ?



egreen.adice.asso.fr



Test your knowledge



Measure the impact of your habits



Set of recommended actions to reduce your impact





egreen.adice.asso.fr



PRACTICAL TOOLS

- ▶ Available online and to download with free access

