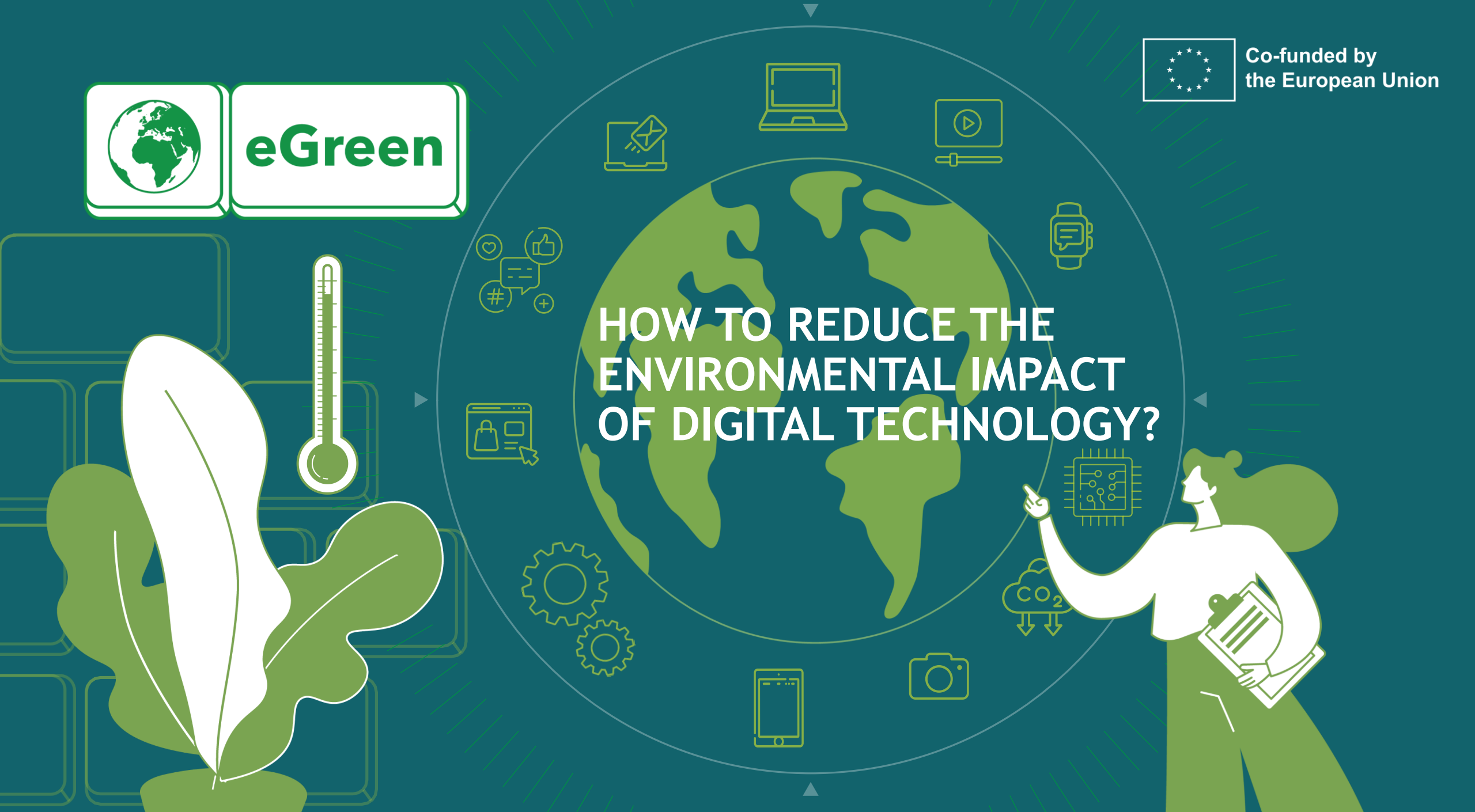
eGreen

Co-funded by
the European Union

HOW TO REDUCE THE ENVIRONMENTAL IMPACT OF DIGITAL TECHNOLOGY?



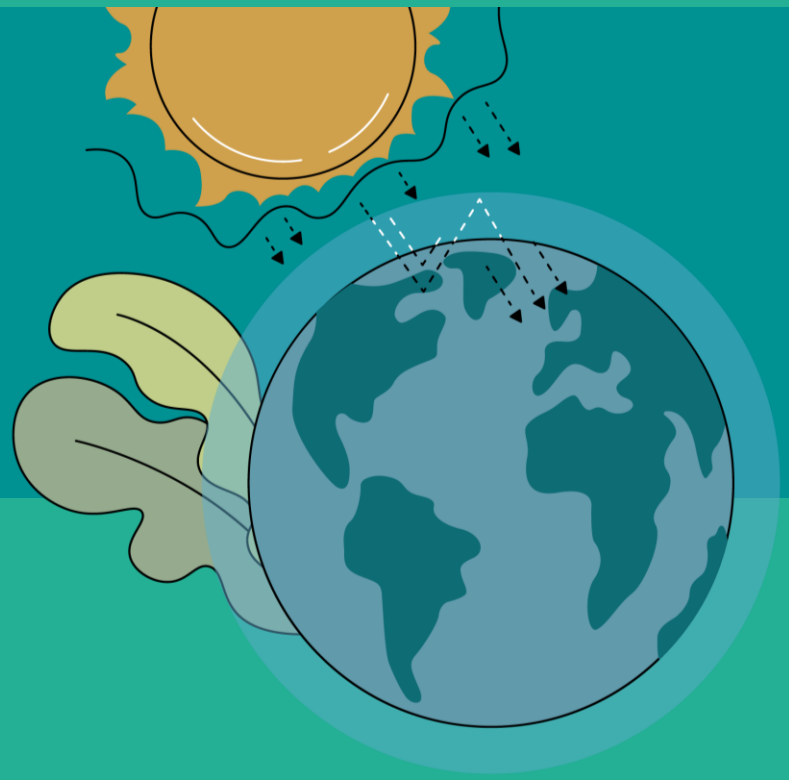
OUTLINE OF THE TRAINING

- Introduction to key concepts
- Production of digital devices
- Daily usage
- End-of-life
- The future of digital technology - initiatives and actions

INTRODUCTION TO KEY CONCEPTS

Climate change & carbon footprint
Lifecycle of digital devices

CLIMATE CHANGE

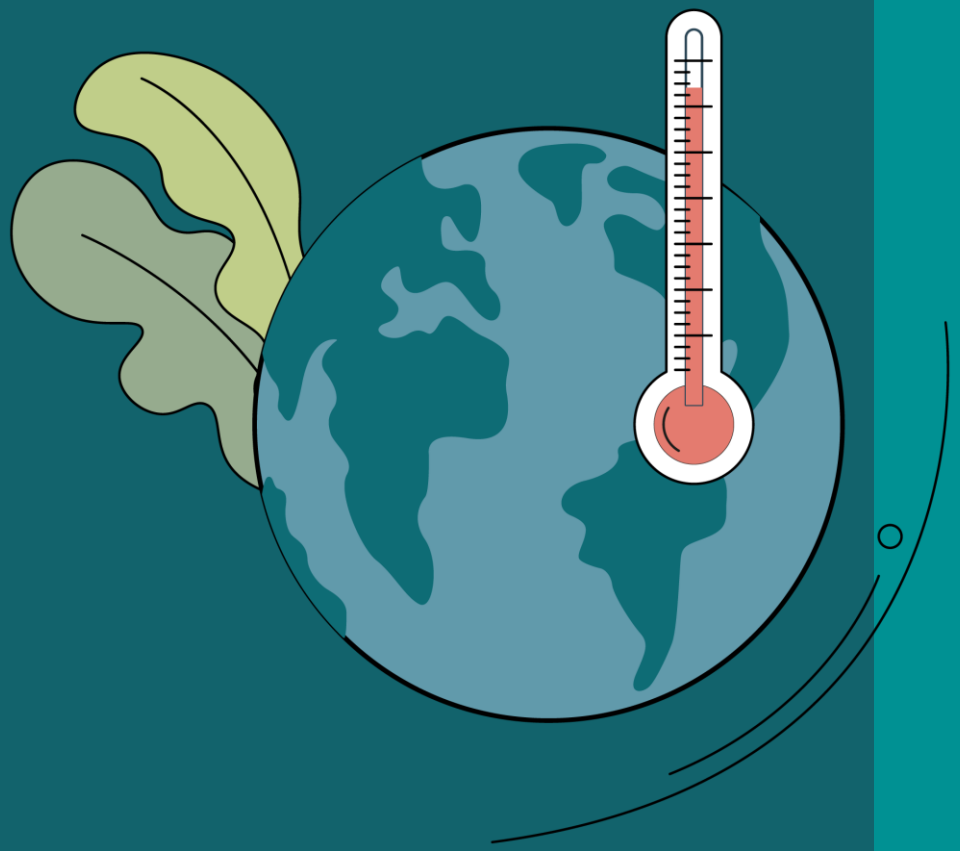


ENVIRONMENTAL IMPACT

CLIMATE CHANGE
= long-term variations in temperature

GLOBAL WARMING
= rise in temperature

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

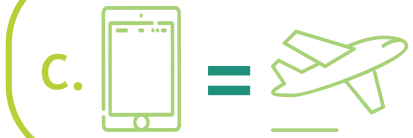
BEEF	365 day	1.33 kg CO2e/day	485.45 kg of CO2e
RICE	365 day	0,27 kg CO2e/day	98.55 kg of CO2e
CARROT	365 day	0,014 kg CO2e/day	5,11 kg of CO2e

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

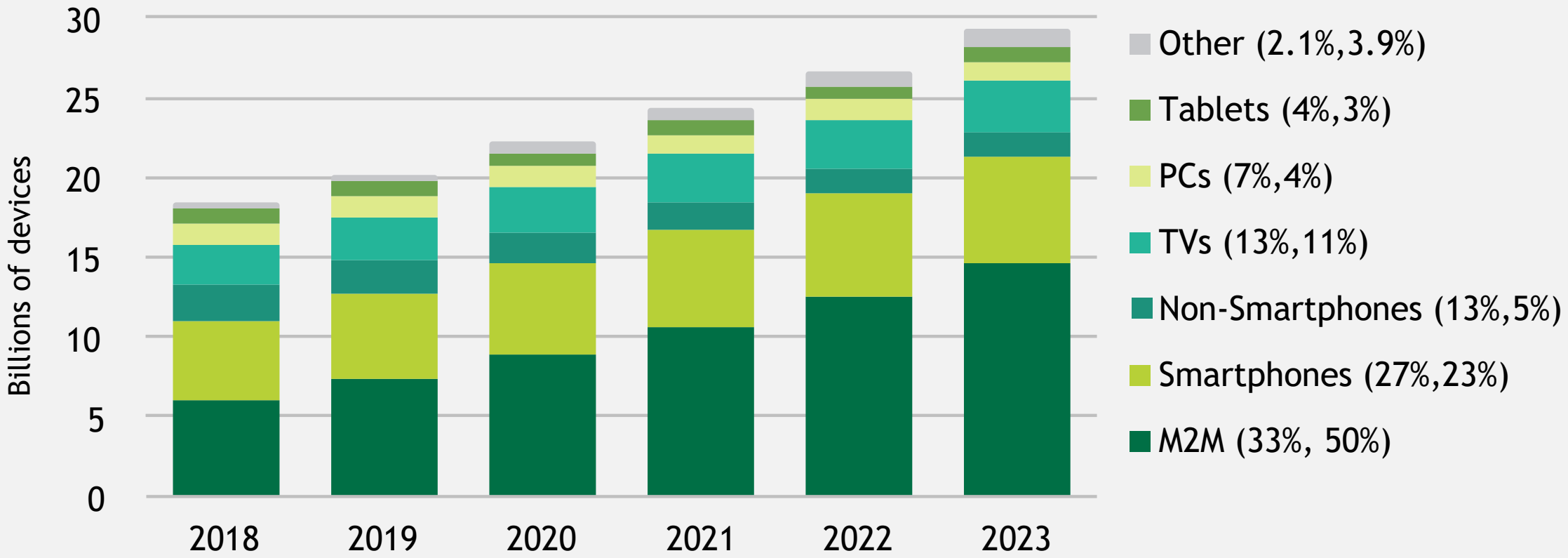
What is the percentage of the digital carbon footprint in global CO_2 emissions?

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?

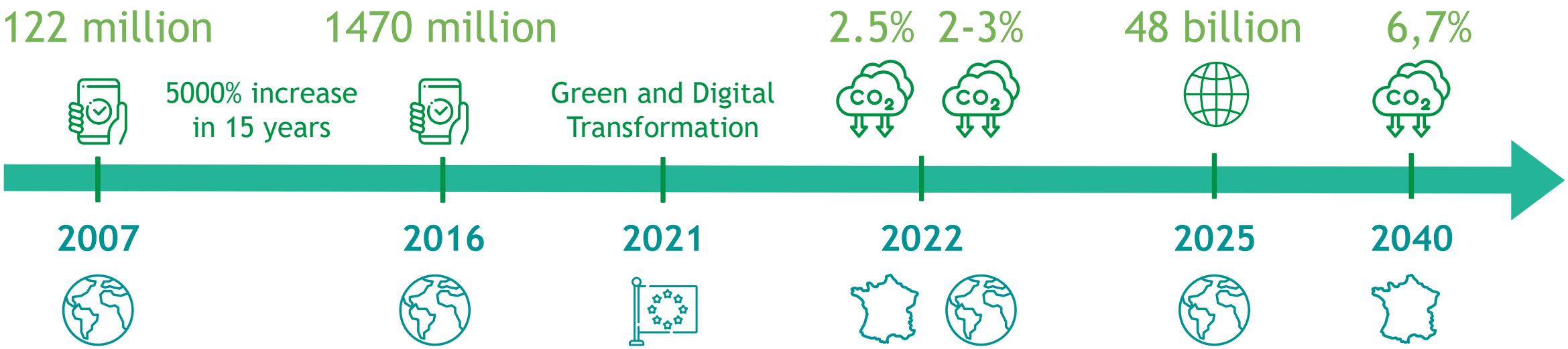
A.  B.  **C.** 

MOST USED DIGITAL DEVICES IN 2023



Source: Cisco Annual Internet Report, 2018–2023

A GROWING IMPACT OF DIGITAL CARBON FOOTPRINT

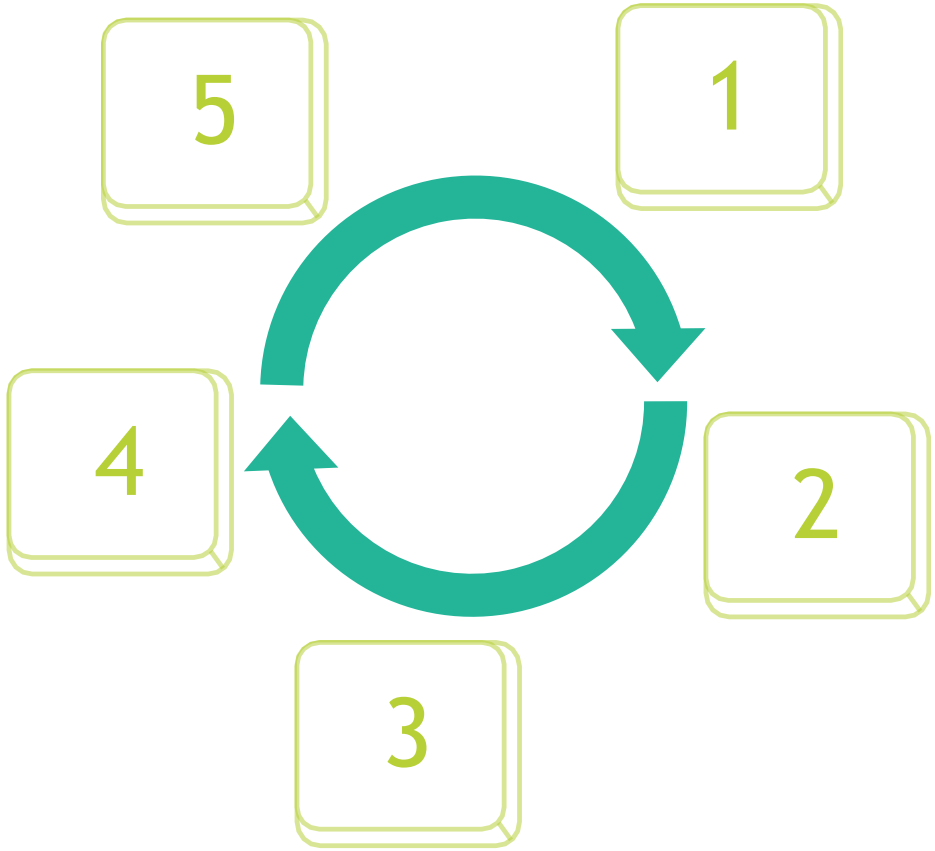


62.5 million tons extracted

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

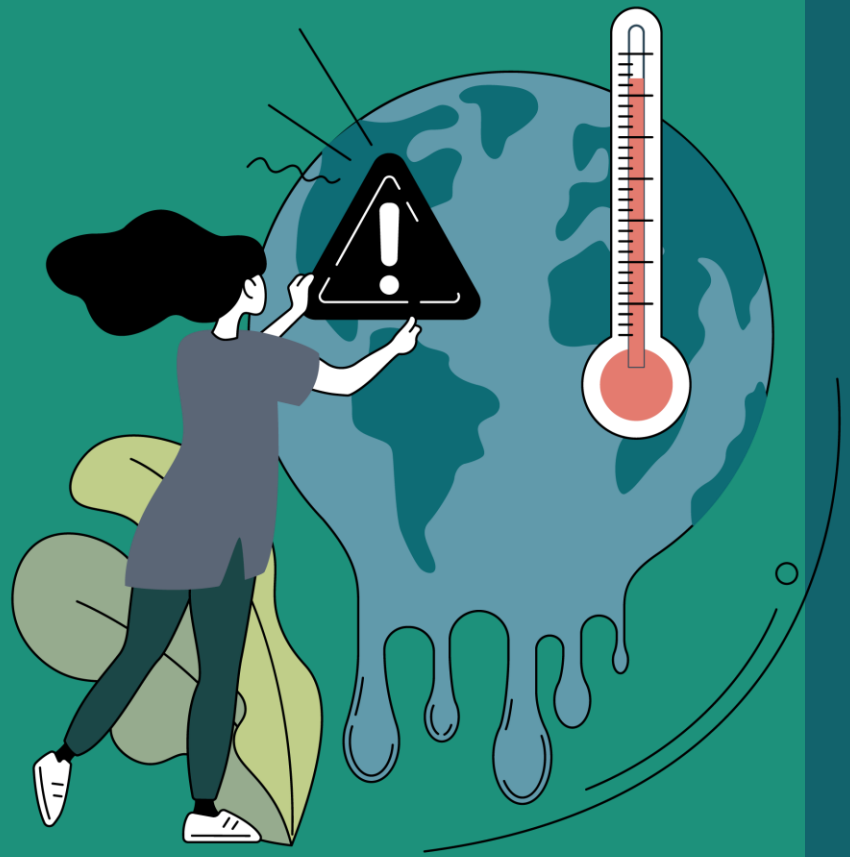
By 2040, global demand multiplied by 4x

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



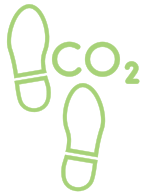
Exhaustion of natural resources

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

1. NEED
2. IMMEDIATE
3. SIMILAR
4. ORIGIN
5. USEFUL

DAILY USAGE OF DIGITAL DEVICES

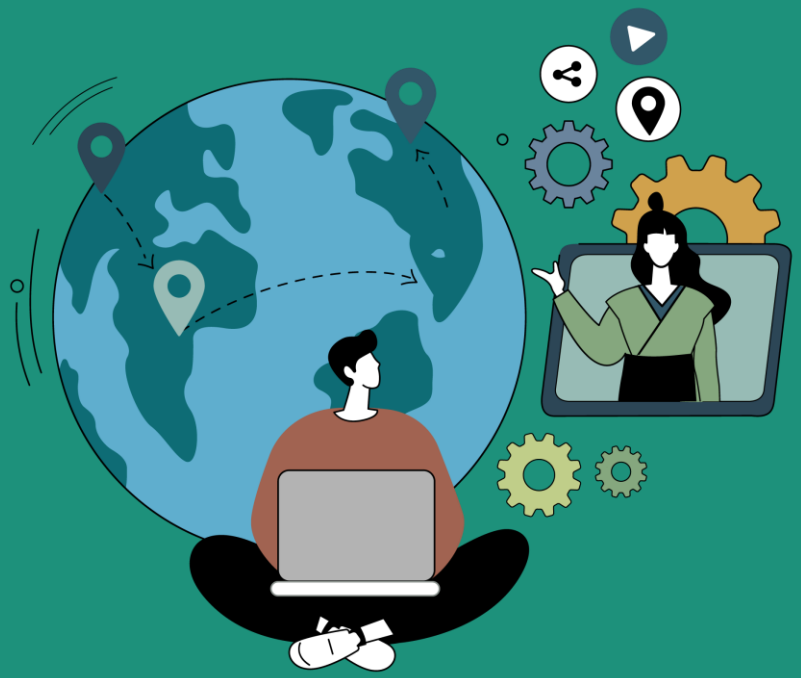
The integration of digital devices
How to use digital devices

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%**

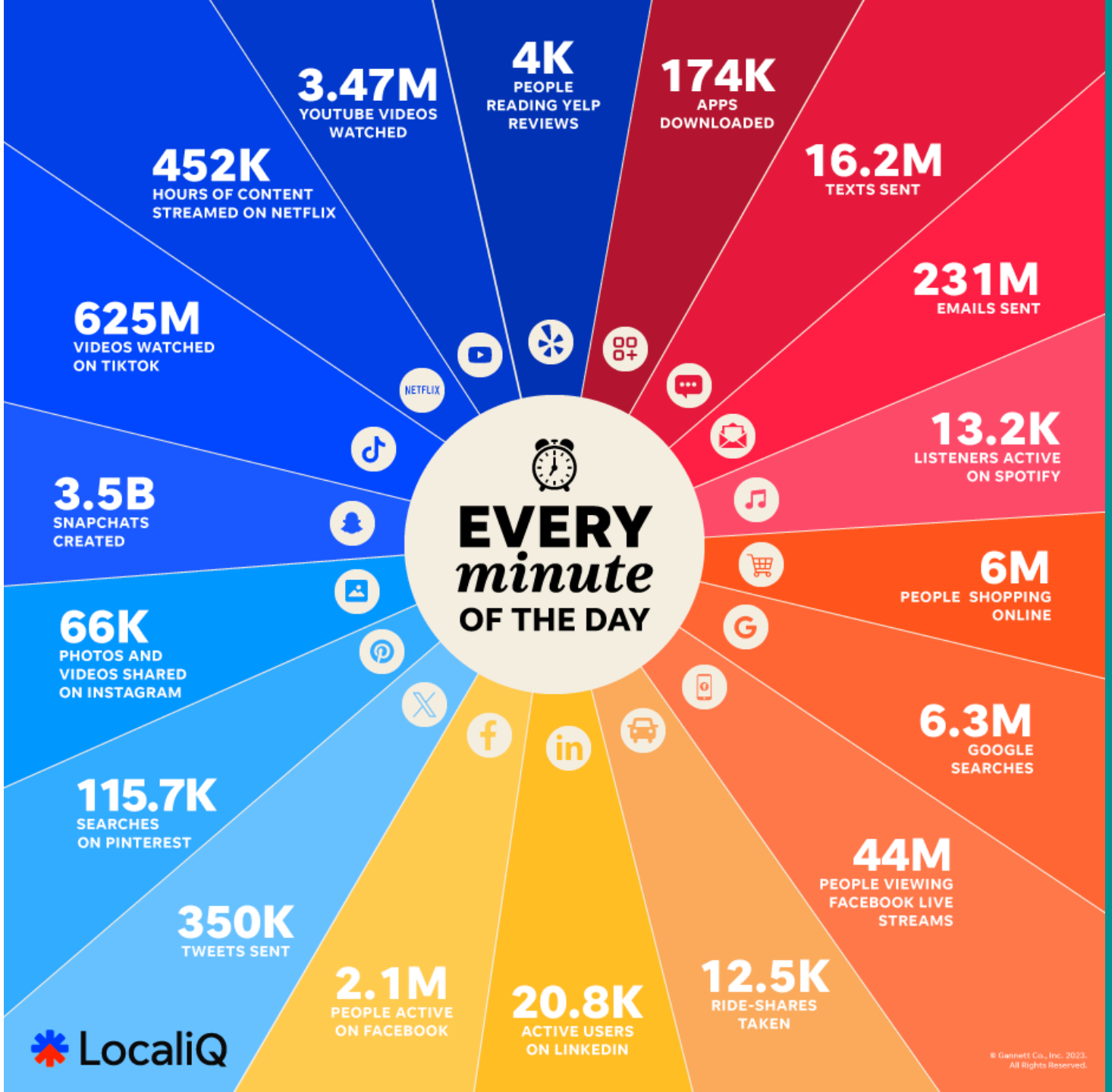
92% of the population in high income countries have direct access to internet

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

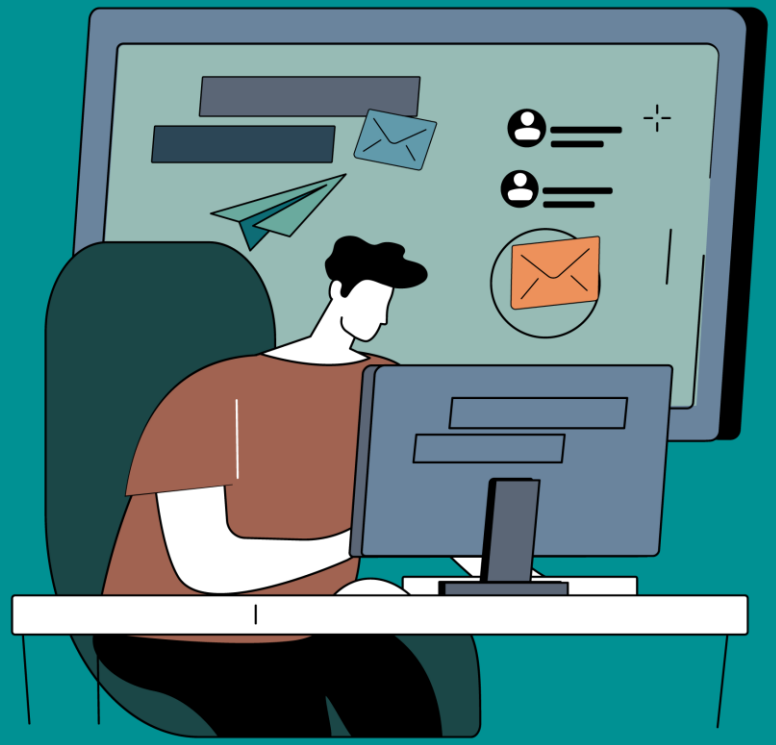
USAGE OF DIGITAL DEVICES (A.5)

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


EVERY minute OF THE DAY
3.47M YOUTUBE VIDEOS WATCHED
4K PEOPLE READING YELP REVIEWS
174K APPS DOWNLOADED
16.2M TEXTS SENT
231M EMAILS SENT
13.2K LISTENERS ACTIVE ON SPOTIFY
6M PEOPLE SHOPPING ONLINE
6.3M GOOGLE SEARCHES
44M PEOPLE VIEWING FACEBOOK LIVE STREAMS
12.5K RIDE-SHARES TAKEN
20.8K ACTIVE USERS ON LINKEDIN
2.1M PEOPLE ACTIVE ON FACEBOOK
350K TWEETS SENT
115.7K SEARCHES ON PINTEREST
66K PHOTOS AND VIDEOS SHARED ON INSTAGRAM
3.5B SNAPCHATS CREATED
625M VIDEOS WATCHED ON TIKTOK
452K HOURS OF CONTENT STREAMED ON NETFLIX
NETFLIX
LocaliQ
© Gannett Co., Inc. 2023. All Rights Reserved.

USAGE OF DIGITAL DEVICES



DIGITAL SERVICE

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

SOFTWARES

HARDWARES

INFRASTRUCTURES (DATA CENTERS)

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

Spend 1 hour on social media daily for a week

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

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

Send and receive 100 emails (without attachments)

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

source: ADEME https://archives.qqf.fr/infographie/69/pollution-numerique-du-clic-au-declic

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

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

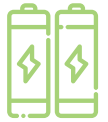
Worldwide e-waste

=

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

Neodymium

Indium



Cobalt

LOSS OF VALUABLE MATERIALS

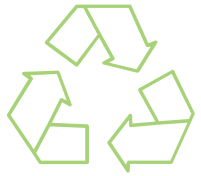
ENVIRONMENTAL IMPACT OF E-WASTE

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 evolutional) 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.

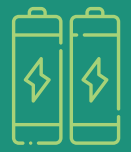
Outcome of marketing strategies of tech companies

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 repairability 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

Prevent overheating and damages

Guarantee battery life

Clean your devices

Choose the right parameters

Deactivate the unnecessary

Adopt alternating load

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

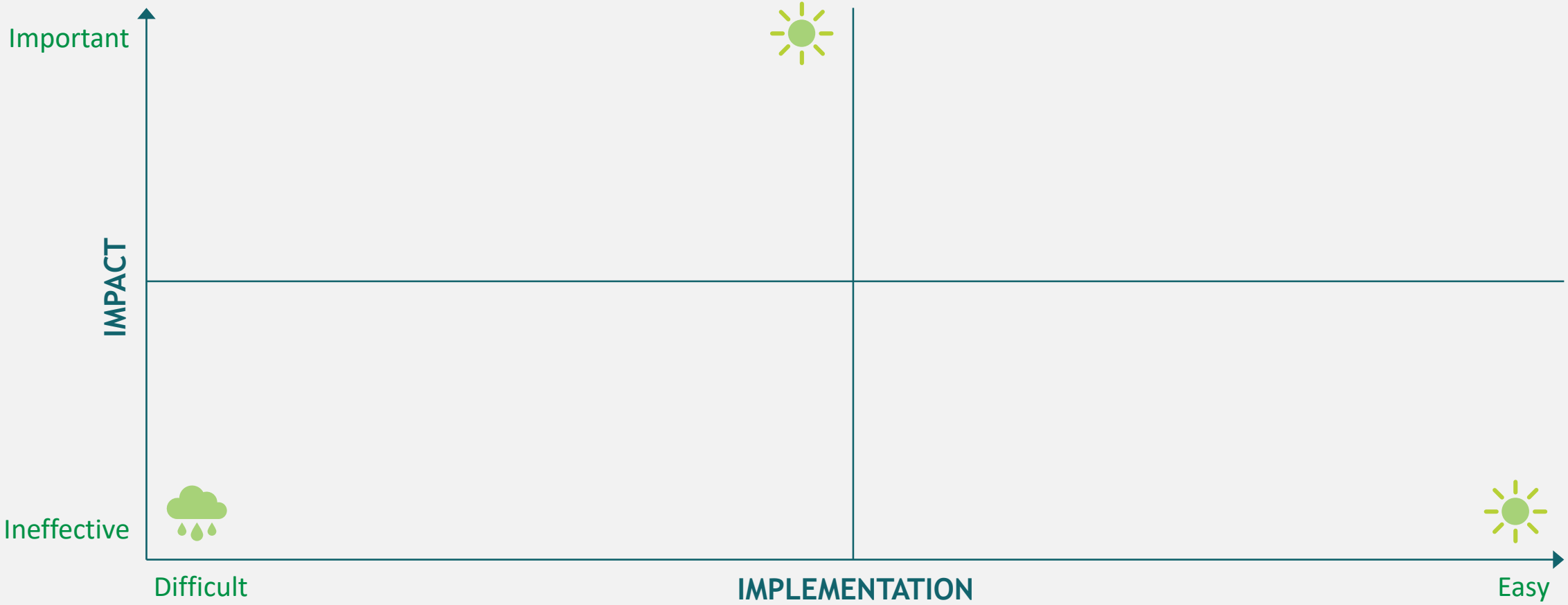
EU Green Deal

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 repairability 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

https://jamboard.google.com/d/1qGFXqk-WHqcQ1UHiRMz074_lPEWviJA_NGfXuaUHti4/edit?usp=sharing

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

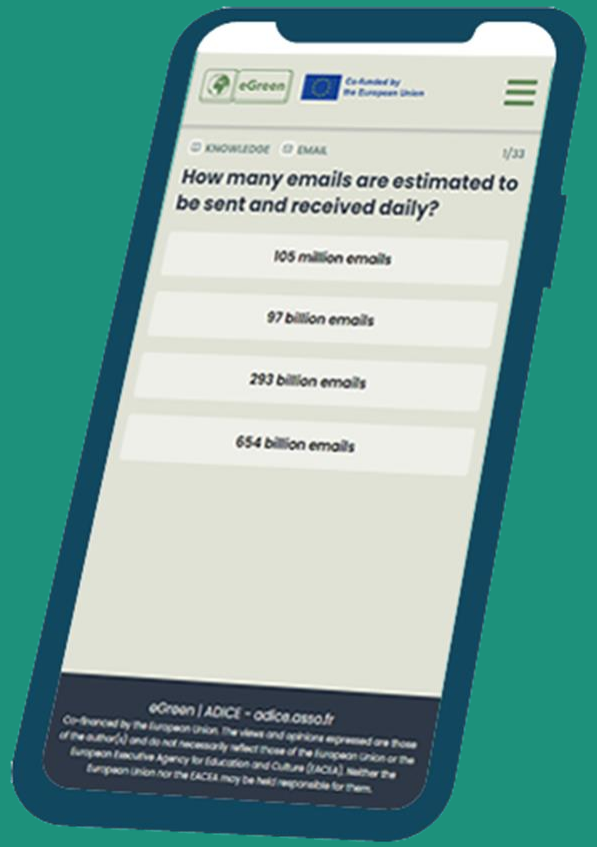
USAGE

- 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

QUIZ

Test your knowledge

Measure the impact of your habits

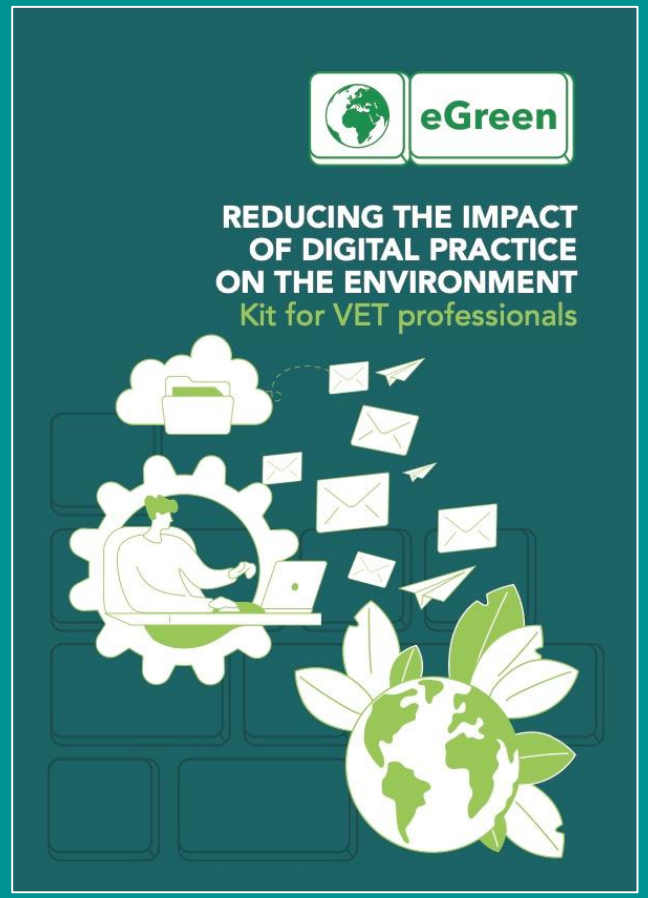
Set of recommended actions to reduce your impact

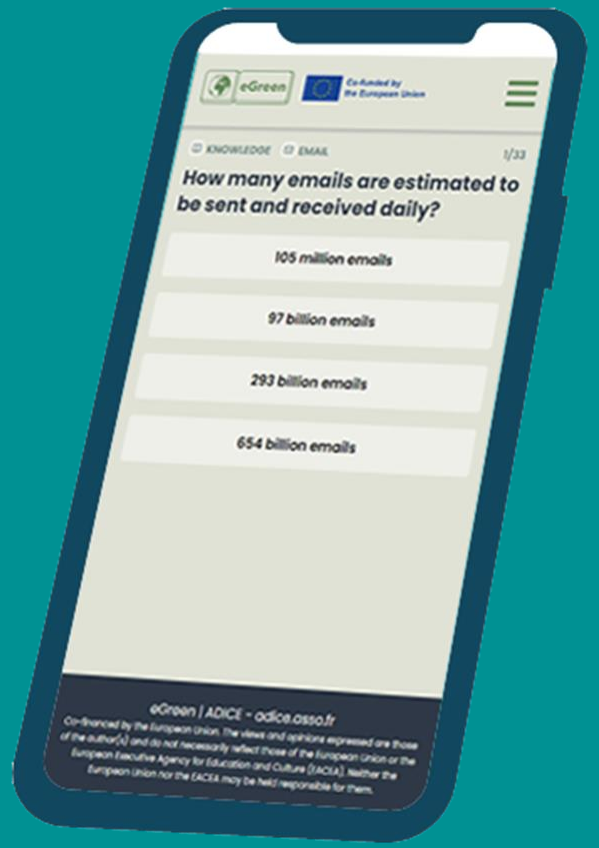
PRACTICAL TOOLS

Co-funded by the European Union

egreen.adice.asso.fr

Available online and to download with free access





Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.