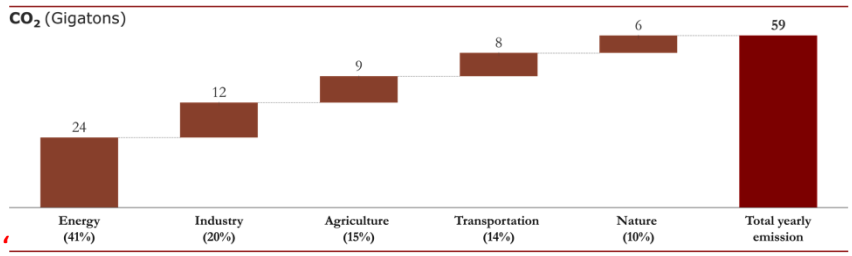
Chapter 1: Our Most Significant Challenge Ahead

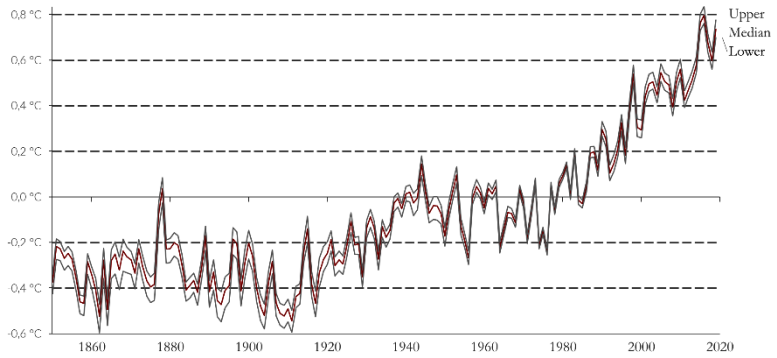


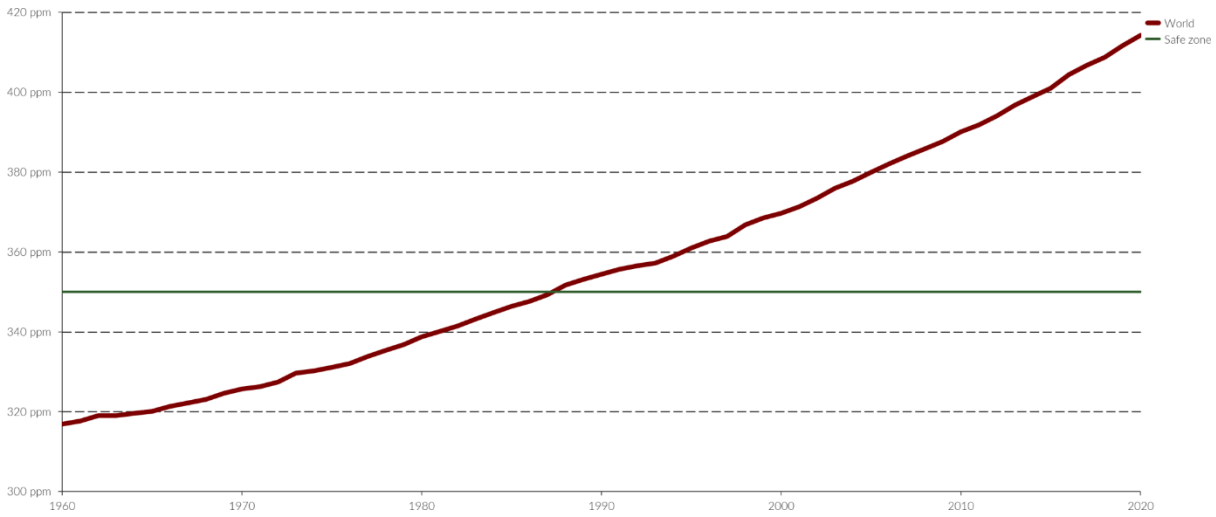
Single flight from London to Los Angeles renders **1.4** tons of CO2e.

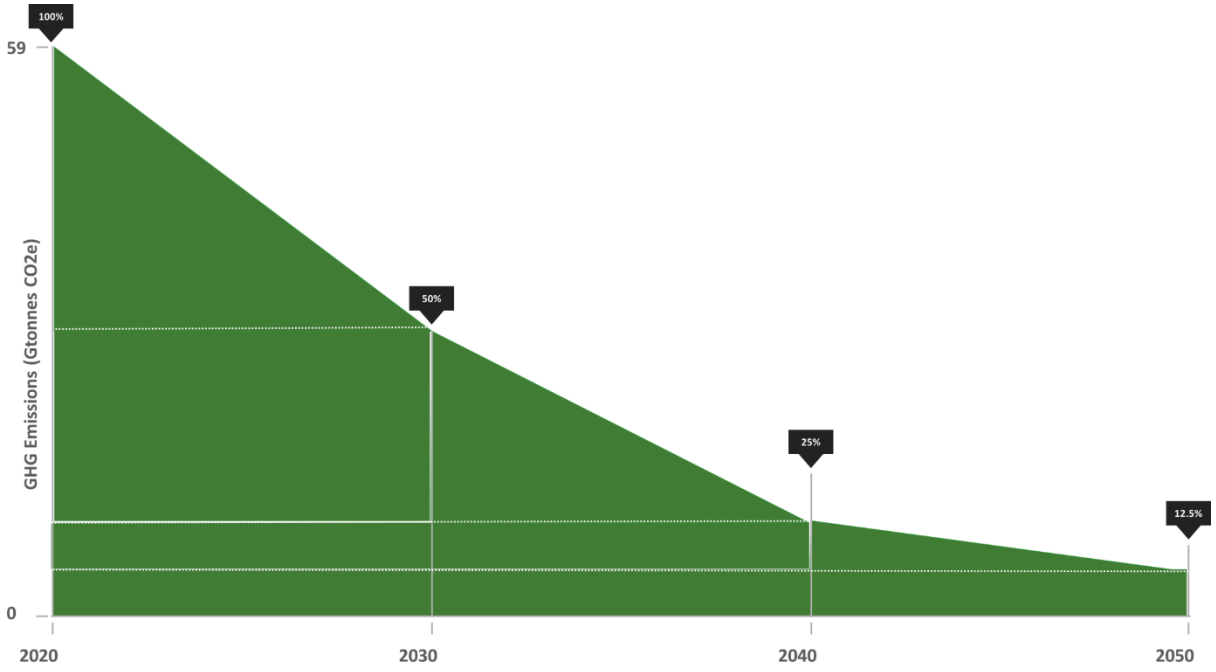
Roughly **8.1** months carbon dioxide budget for one person

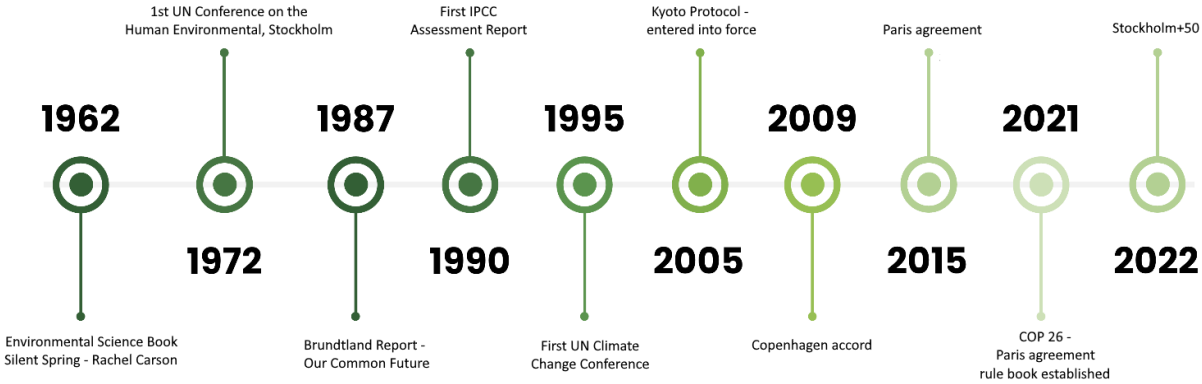
Mining of the world's Bitcoin renders a carbon footprint of **114** Mt CO_2

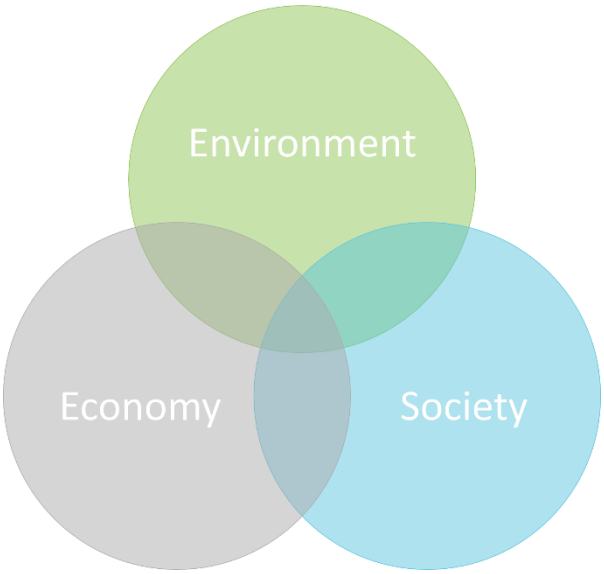
Equivalent to the carbon footprint of Czech Republic

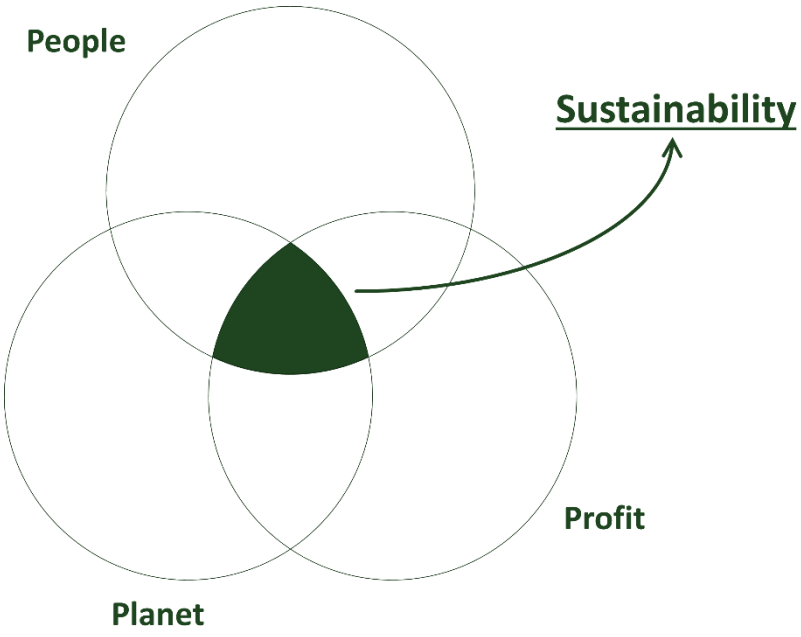



420 ppm
400 ppm
380 ppm
360 ppm
340 ppm
320 ppm
300 ppm
1960
1970
1980
1990
2000
2010
2020
World
Safe zone


100%
59
GHG Emissions (Gtonnes CO2e)
50%
25%
12.5%
0
2020
2030
2040
2050

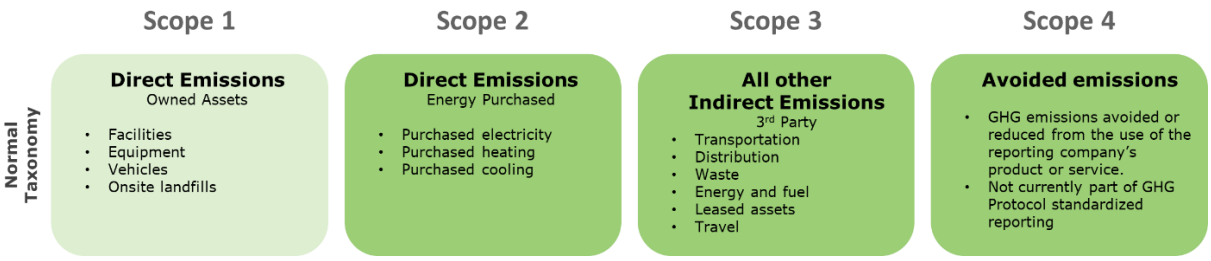

1962
Environmental Science Book
Silent Spring - Rachel Carson
1972
1st UN Conference on the
Human Environmental, Stockholm
1987
Brundtland Report -
Our Common Future
1990
First IPCC
Assessment Report
1995
First UN Climate
Change Conference
2005
Kyoto Protocol -
entered into force
2009
Copenhagen accord
2015
Paris agreement
2021
COP 26 -
Paris agreement
rule book established
2022
Stockholm+50

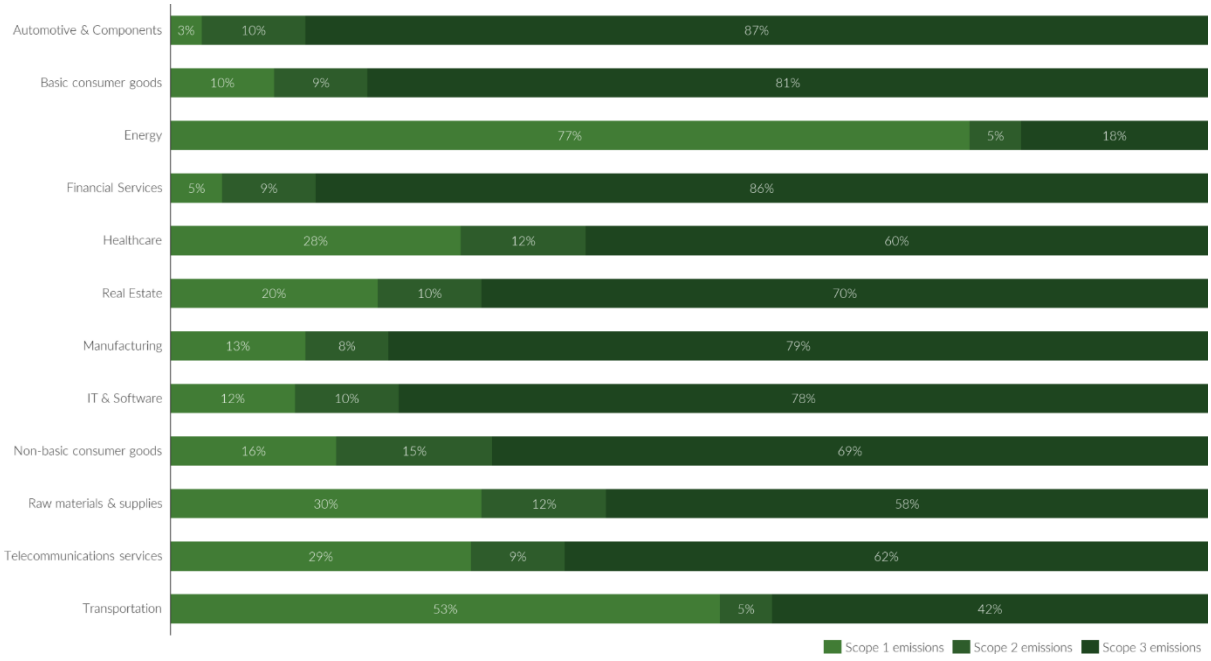




- Climate change mitigation
- Climate change adaptation
- sustainable and protection of water and marine resources;
- transition to a circular economy
- pollution prevention and control;
- protection and restoration of biodiversity and ecosystems.


Financial institutions & Large companies: Report on Taxonomy **Eligibility**
Large companies: Report on Taxonomy **Alignment**
Financial institutions & Large companies: Report on Taxonomy **Alignment**
2022
2023
2024
Technical screening criteria for climate change adaptation & mitigation starts to apply
Technical screening criteria for remaining environmental objectives starts to apply
Full EU Taxonomy disclosure


Scope 1
Scope 2
Scope 3
Scope 4
Normal Taxonomy
Direct Emissions
Owned Assets
• Facilities
• Equipment
• Vehicles
• Onsite landfills
Direct Emissions
Energy Purchased
• Purchased electricity
• Purchased heating
• Purchased cooling
All other Indirect Emissions
3rd Party
• Transportation
• Distribution
• Waste
• Energy and fuel
• Leased assets
• Travel
Avoided emissions
• GHG emissions avoided or reduced from the use of the reporting company's product or service.
• Not currently part of GHG Protocol standardized reporting


Automotive & Components 3% 10% 87%
Basic consumer goods 10% 9% 81%
Energy 77% 5% 18%
Financial Services 5% 9% 86%
Healthcare 28% 12% 60%
Real Estate 20% 10% 70%
Manufacturing 13% 8% 79%
IT & Software 12% 10% 78%
Non-basic consumer goods 16% 15% 69%
Raw materials & supplies 30% 12% 58%
Telecommunications services 29% 9% 62%
Transportation 53% 5% 42%
Scope 1 emissions
Scope 2 emissions
Scope 3 emissions

A Dramatically Different top 12

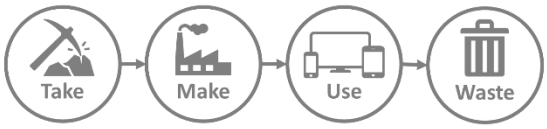
Top 12 in 2022	Market CAP ($B)
Apple	$2 652
Microsoft	$2 222
Alphabet/Google	$1 951
Amazon	$1 446
Meta/Facebook	$843
Berkshire Hathaway	$682
Tencent	$573
Johnson & Johnson	$434
JP Morgan Chase	$427
Wal-Mart Stores	$388
Alibaba	$344
Exxon Mobil	$307

Top 12 in 2015	Market CAP ($B)
Apple	$710
Alphabet/Google	$449
Microsoft	$368
Exxon Mobil	$334
Wells Fargo	$297
Johnson & Johnson	$274
Facebook	$272
General Electric	$259
JP Morgan Chase	$255
Amazon	$247
Wal-Mart Stores	$230
Proctor & Gamble	$218

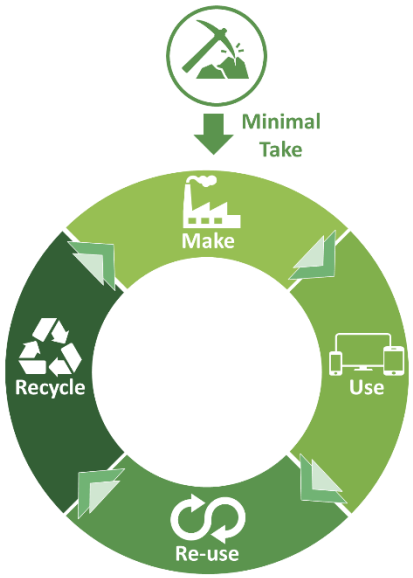
Top 12 in 2000	Market CAP ($B)
General Electric	$474
Exxon Mobil	$302
Pfizer	$290
Citigroup	$287
Cisco	$275
Wal-Mart Stores	$287
Microsoft	$231
AIG	$229
Merck	$216
Intel	$202
Johnson & Johnson	$181
Coca-Cola	$164

Data: https://companiesmarketcap.com/ 2022 valuations as 1/28/22

Linear Economy



Circular Economy

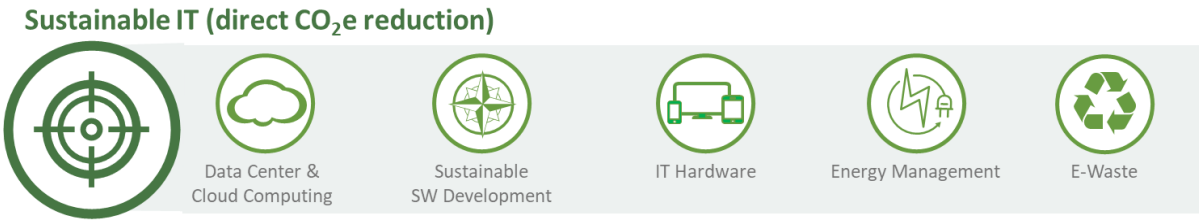


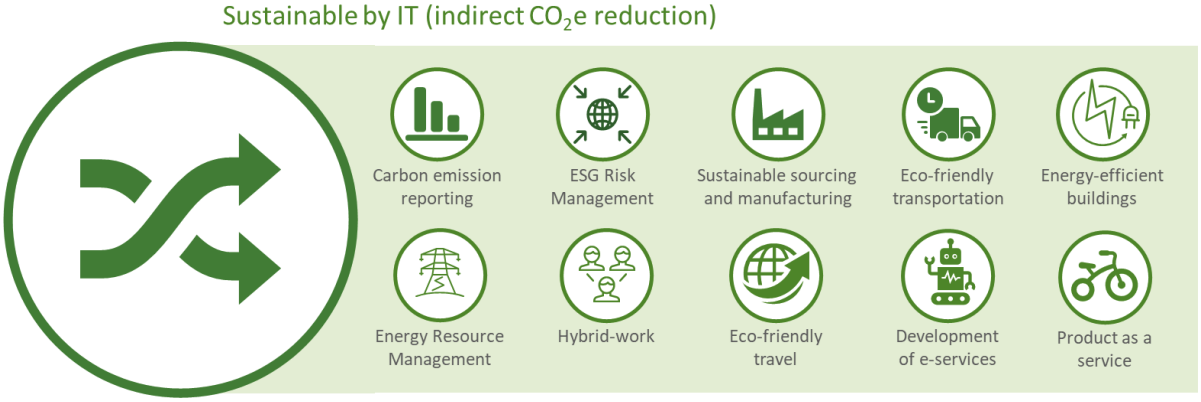
Chapter 2: Rise of Sustainable IT

1-2% of the world's energy is consumed by data centers

The number of devices is expected to reach **55.7** billion in 2025

57 million tons of e-waste were generated worldwide in 2021





Sustainable IT Taxonomy©

Direct Emissions
Owned Assets

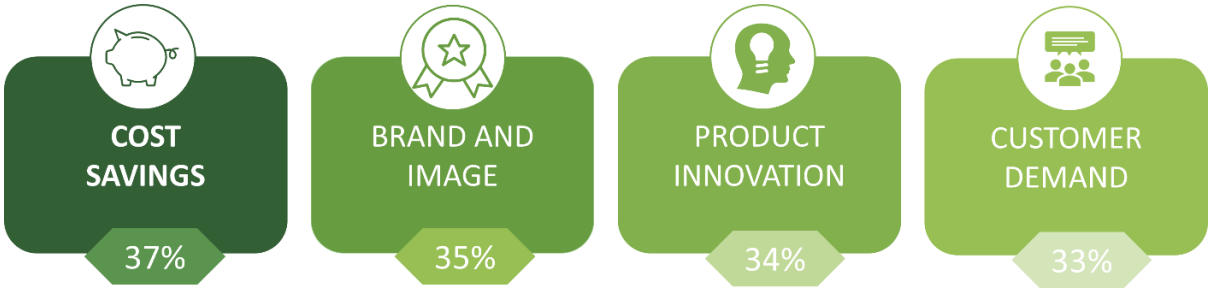
- Operator activities

Direct Emissions
Energy Purchased

Purchased electricity, heating & cooling for own Data Centers, Networks, Servers & End User IT Equipment

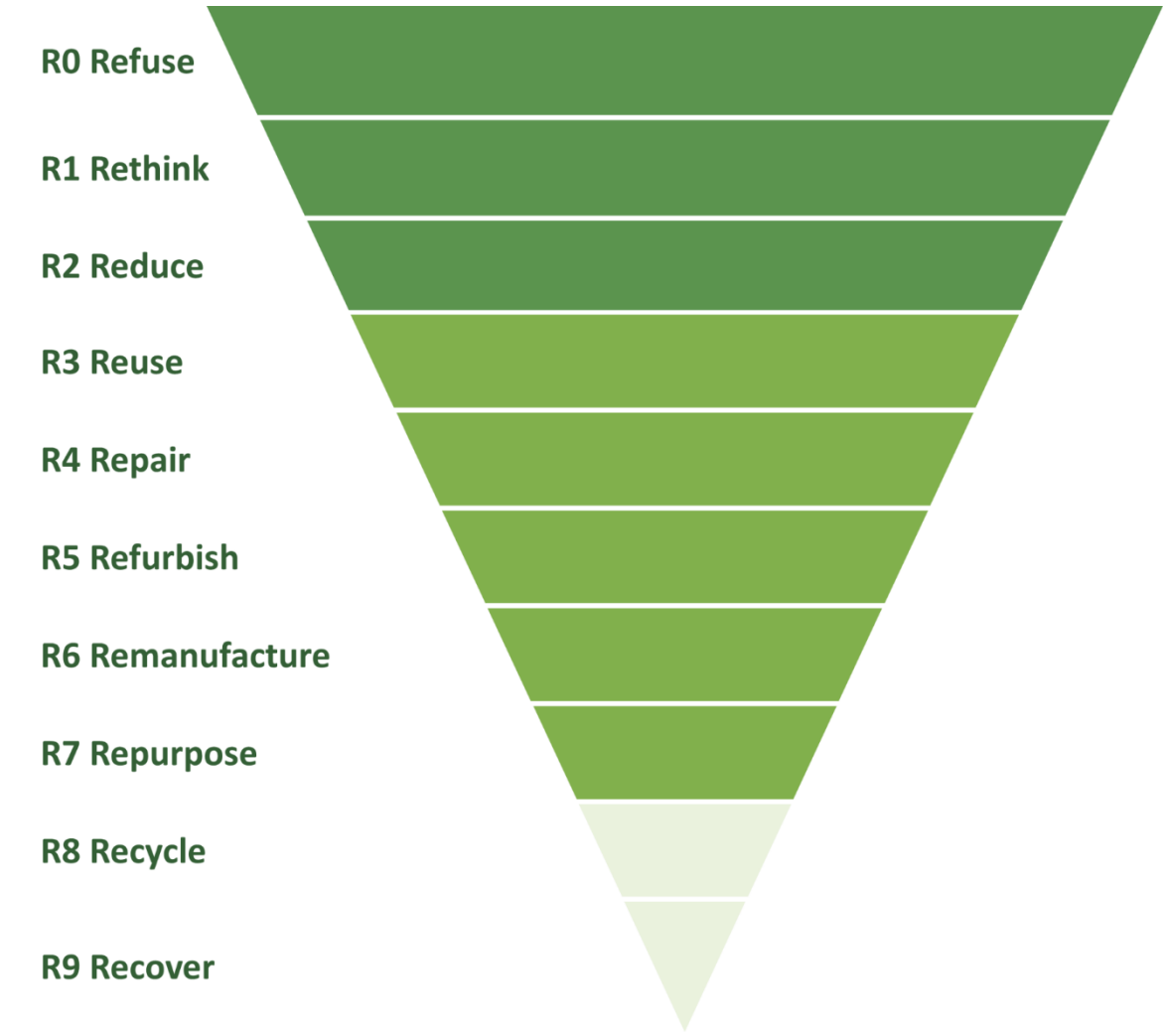
All other Indirect Emissions
3rd Party

- Data Center construction
- IaaS / PaaS / SaaS
- ICT Equipment
- Software
- Professional Svc. Providers

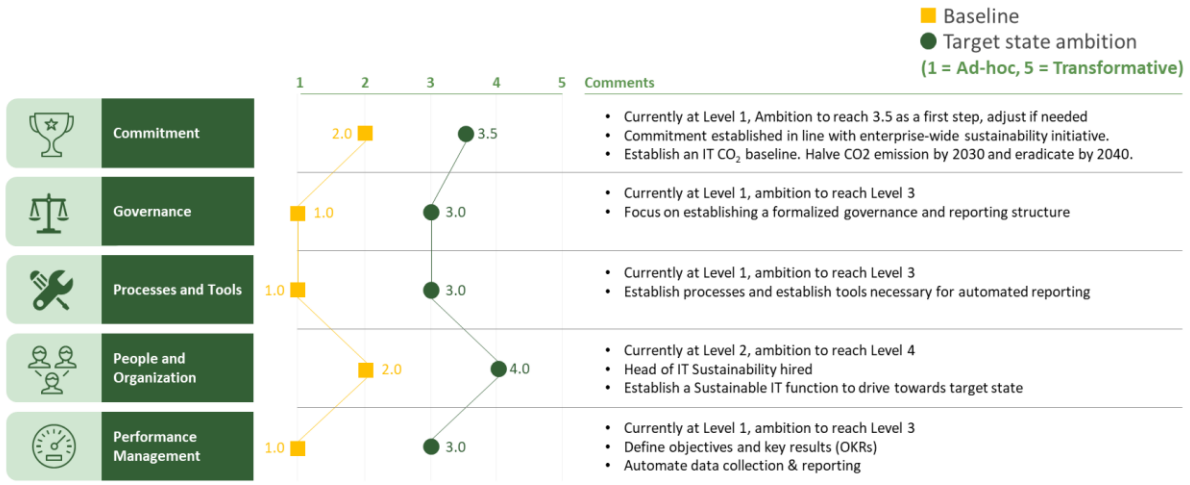

COST SAVINGS
37%
BRAND AND IMAGE
35%
PRODUCT INNOVATION
34%
CUSTOMER DEMAND
33%

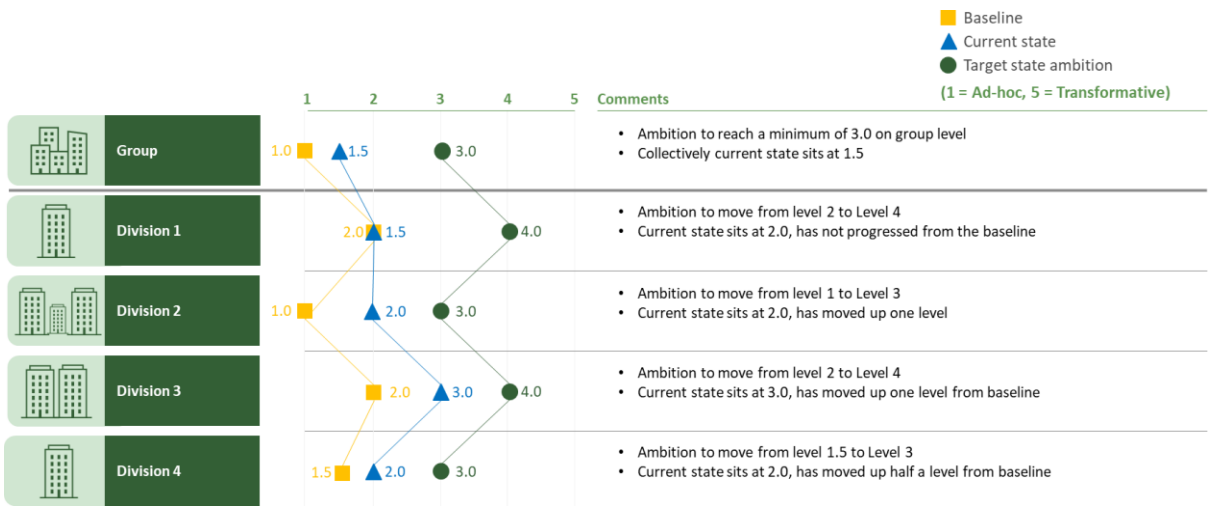

Legislation
Investor, social and political Pressure
Customer requirements
Responsible business ecosystems
New market opportunities
Cost reductions


Financial value
Non-financial value
Risks
Employee engagement
Readiness

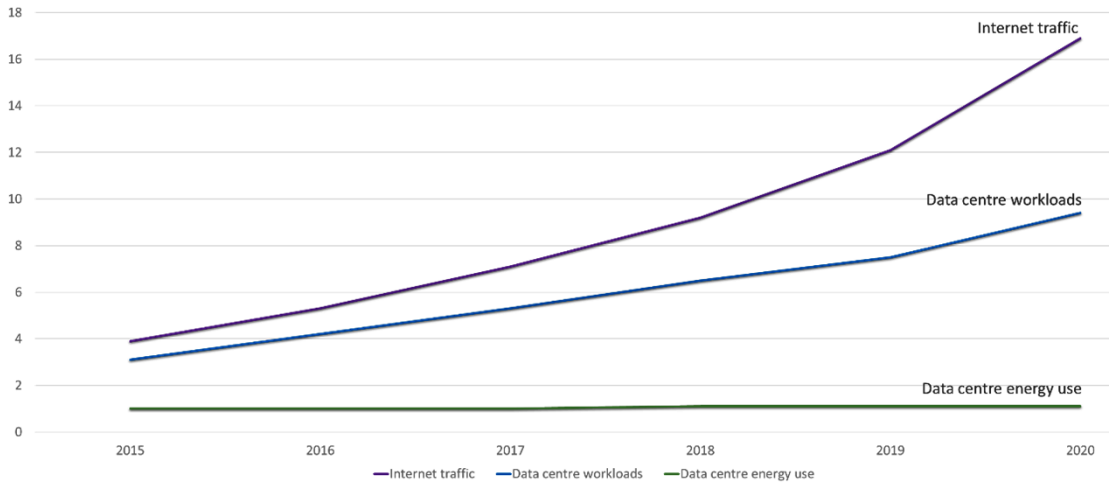


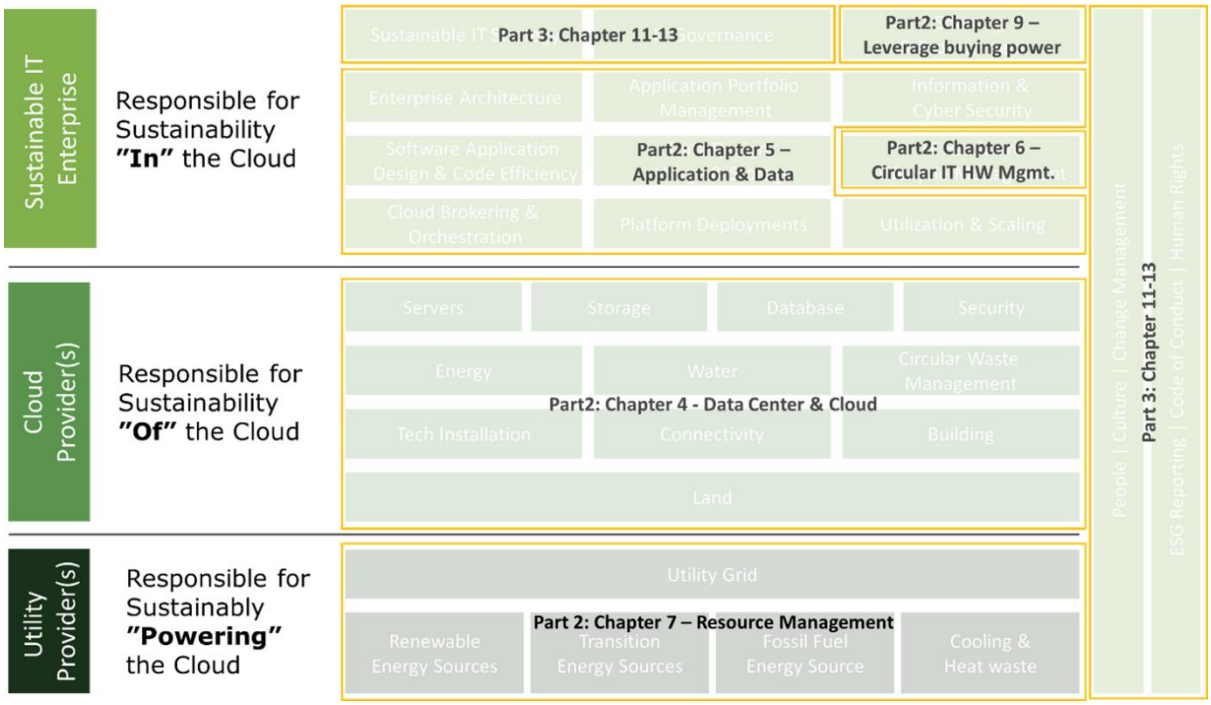
Assess Current State	Set Ambition Target State	Compare Current and Target State	Set Direction of travel
✓ What is your starting point today?	✓ What is your ambition?	✓ What is your gap between current and target state?	✓ What is your timeline to close the gap between current and target state?
✓ What is your current maturity?	✓ Is your ambition aligned with corporate ambition?	✓ What capabilities are needed in terms of people, process and technology?	✓ What are the key milestones along the roadmap?


Baseline
Target state ambition
(1 = Ad-hoc, 5 = Transformative)
1
2
3
4
5
Comments
Commitment
2.0
3.5
• Currently at Level 1, Ambition to reach 3.5 as a first step, adjust if needed
• Commitment established in line with enterprise-wide sustainability initiative.
• Establish an IT CO_2 baseline. Halve CO2 emission by 2030 and eradicate by 2040.
Governance
1.0
3.0
• Currently at Level 1, ambition to reach Level 3
• Focus on establishing a formalized governance and reporting structure
Processes and Tools
1.0
3.0
• Currently at Level 1, ambition to reach Level 3
• Establish processes and establish tools necessary for automated reporting
People and Organization
2.0
4.0
• Currently at Level 2, ambition to reach Level 4
• Head of IT Sustainability hired
• Establish a Sustainable IT function to drive towards target state
Performance Management
1.0
3.0
• Currently at Level 1, ambition to reach Level 3
• Define objectives and key results (OKRs)
• Automate data collection & reporting

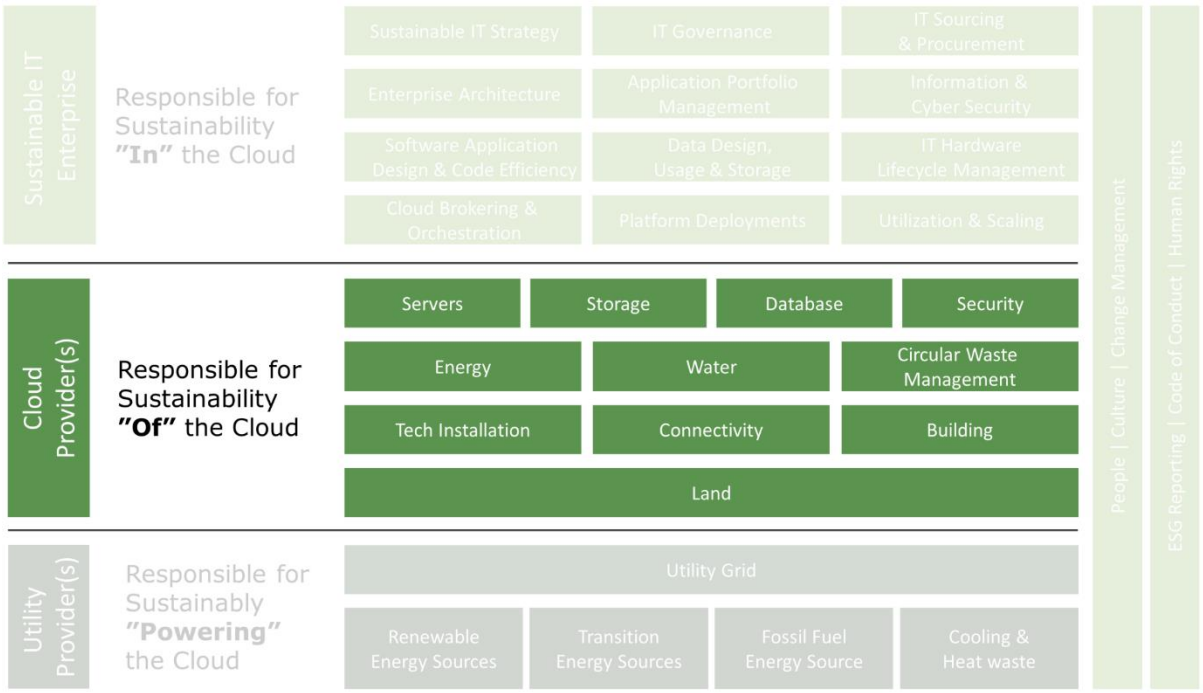

Baseline
Current state
Target state ambition
(1 = Ad-hoc, 5 = Transformative)
1
2
3
4
5
Comments
Group
1.0
1.5
3.0
• Ambition to reach a minimum of 3.0 on group level
• Collectively current state sits at 1.5
Division 1
2.0
1.5
4.0
• Ambition to move from level 2 to Level 4
• Current state sits at 2.0, has not progressed from the baseline
Division 2
1.0
2.0
3.0
• Ambition to move from level 1 to Level 3
• Current state sits at 2.0, has moved up one level
Division 3
2.0
3.0
4.0
• Ambition to move from level 2 to Level 4
• Current state sits at 3.0, has moved up one level from baseline
Division 4
1.5
2.0
3.0
• Ambition to move from level 1.5 to Level 3
• Current state sits at 2.0, has moved up half a level from baseline

Chapter 3: The Fundamental Building Blocks of a Sustainable IT Practice

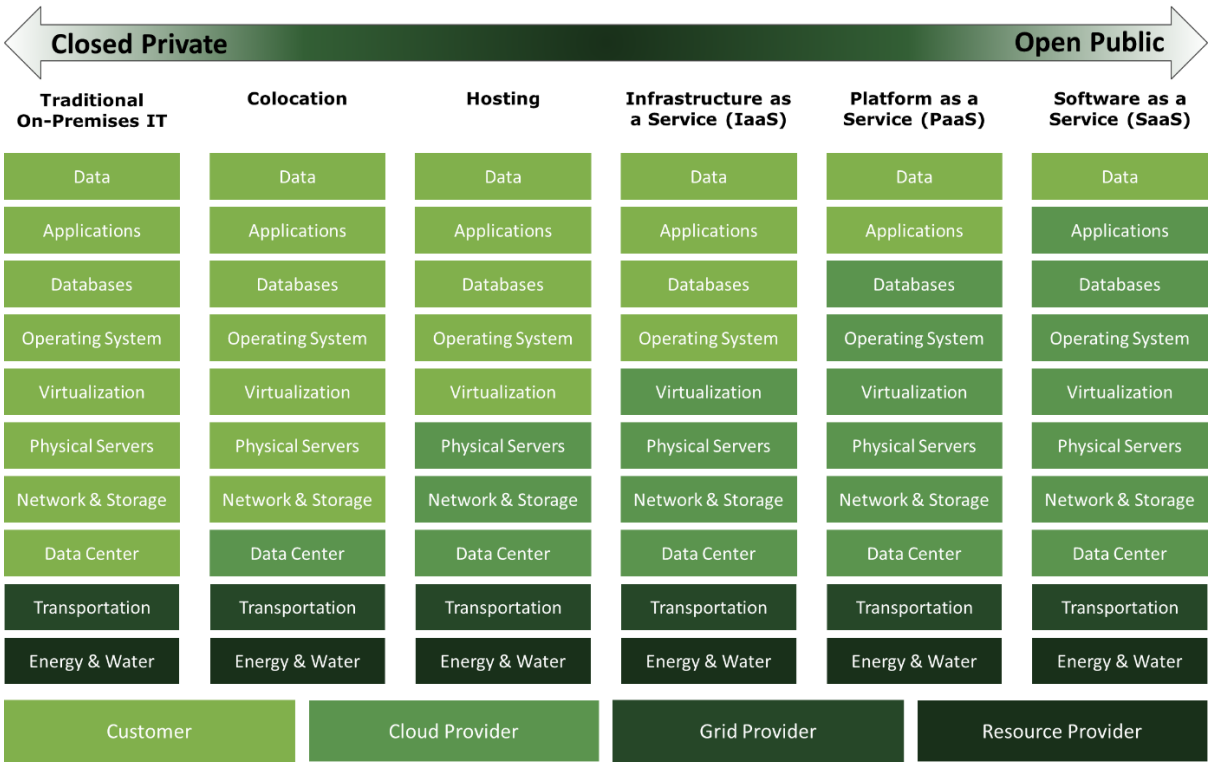




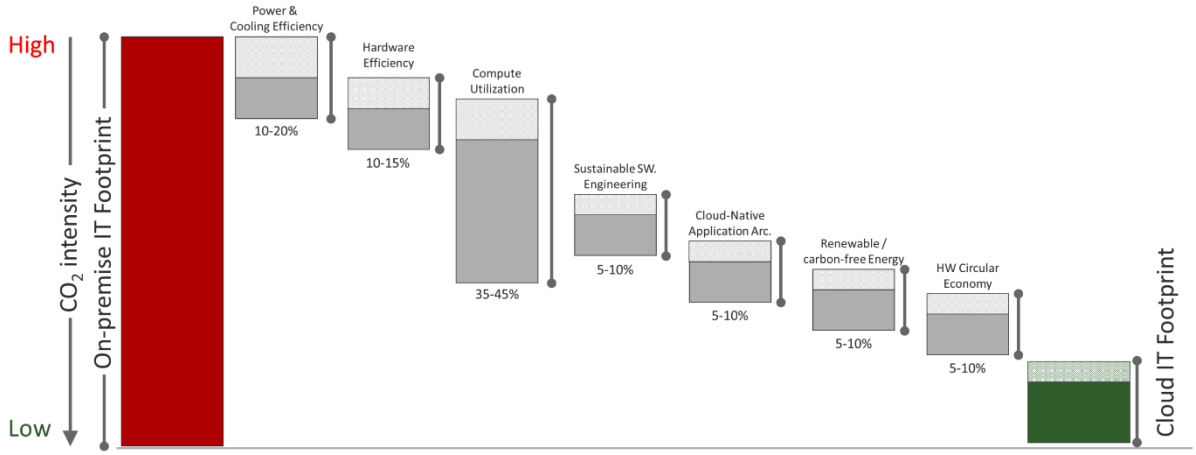
Chapter 4: Data Center & Cloud

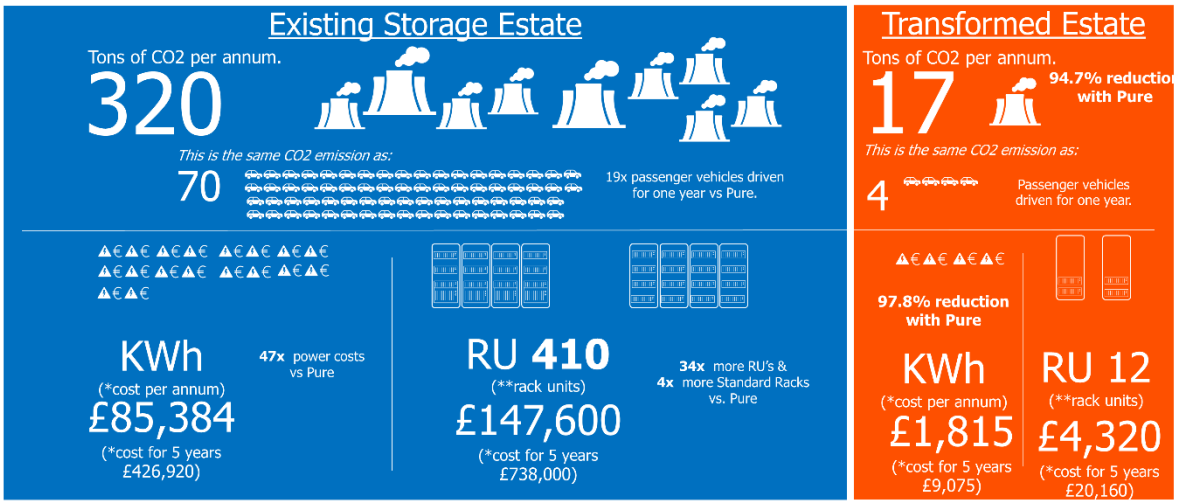


3 Service Models	4 Deployment Models	5 Essential Characteristics
• Software	• Public Cloud	• Service-based
• Platform	• Private Cloud	• Scalable / elastic
• Infrastructure	• Hybrid Cloud	• Shared resources
	• Community Cloud	• Measured / metered
		• Uses Internet

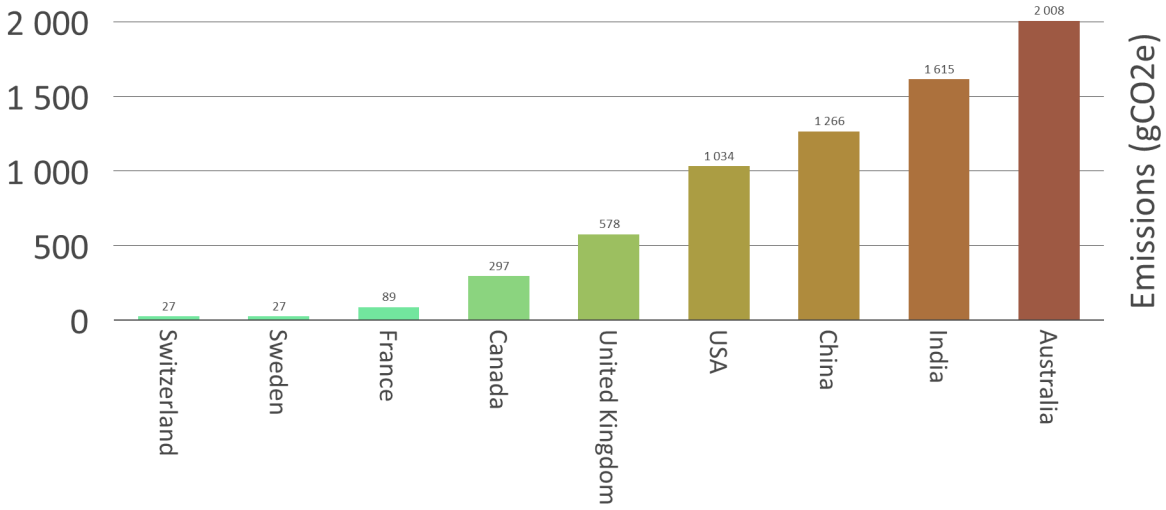

Closed Private
Open Public
Traditional On-Premises IT
Colocation
Hosting
Infrastructure as a Service (IaaS)
Platform as a Service (PaaS)
Software as a Service (SaaS)
Data
Applications
Databases
Operating System
Virtualization
Physical Servers
Network & Storage
Data Center
Transportation
Energy & Water
Customer
Cloud Provider
Grid Provider
Resource Provider


Agility
Scalability
Reliability
Resilience
Cost optimization
Sustainability

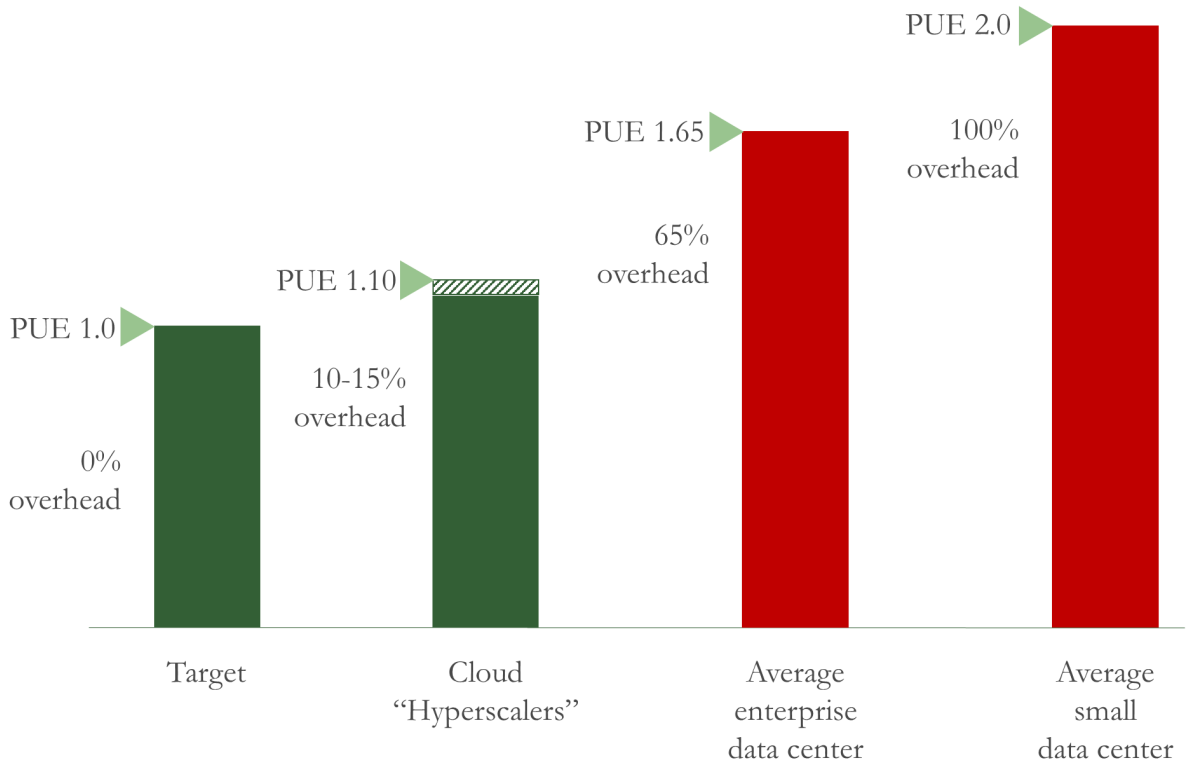

High
Low
CO_2 intensity
On-premise IT Footprint
Power & Cooling Efficiency
10-20%
Hardware Efficiency
10-15%
Compute Utilization
35-45%
Sustainable SW. Engineering
5-10%
Cloud-Native Application Arc.
5-10%
Renewable / carbon-free Energy
5-10%
HW Circular Economy
5-10%
Cloud IT Footprint



*KWh uses market standard pricing (2021)



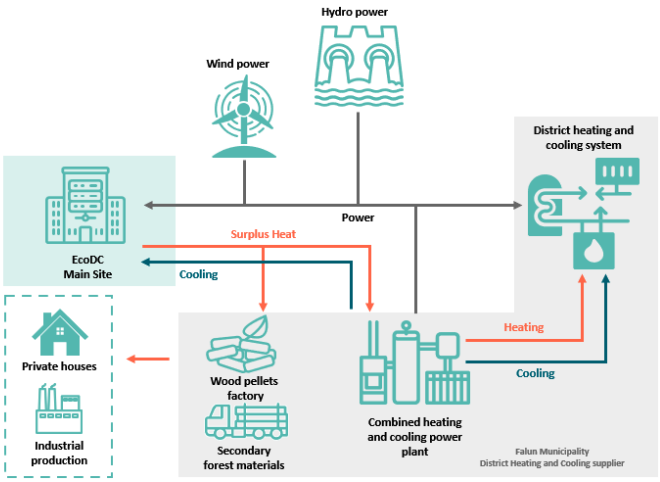
$$PUE = \frac{Total\ facility\ energy}{IT\ equipment\ energy}$$

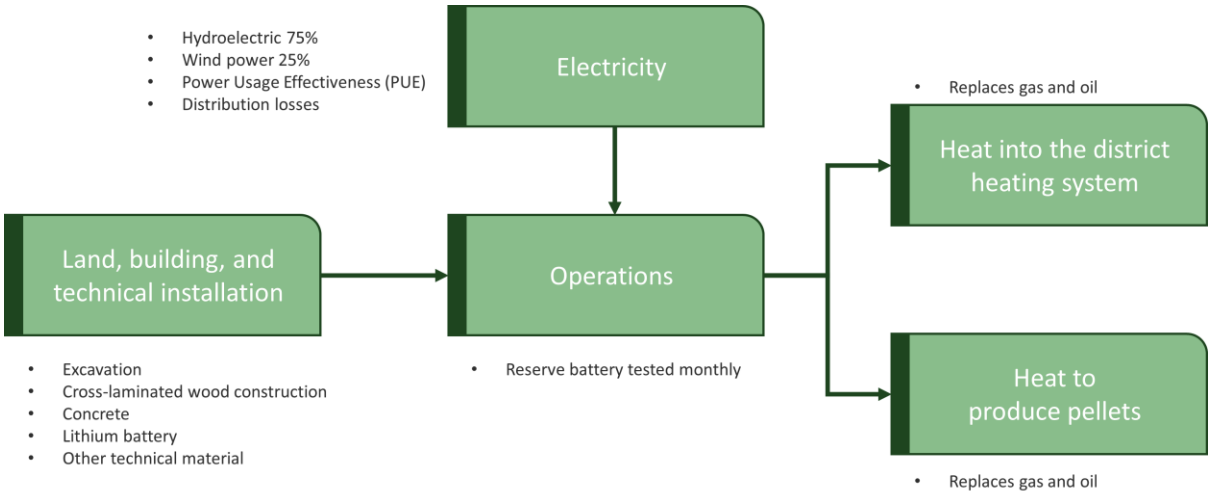


Description	Metric	General Requirement	United Nations Sustainable Development Goals Alignment
Energy Consumption	GWh mtCO2e	**CUE** Carbon Usage Effectiveness	7. Affordable and Clean Energy 13. Climate Action
Renewable Energy	%	**REF** Renewable Energy Factor	9. Industry, Innovation and Infrastructure 12. Responsible Consumption and Production
Power Usage Effectiveness	PUE	**PUE** Power Usage Effectiveness	12. Responsible Consumption and Production 13. Climate Action
Sustainable Water	WUE	**WUE** Water Usage Effectiveness	6. Clean Water and Sanitation
Waste Management	Ton %	**ERF - EDE** Energy Reuse Factor Electronics Disposal Efficiency Reduce – Reuse - Recycle	12. Responsible Consumption and Production

Main sustainability drivers

- **Renewable power**
  - 100% of energy comes purely from renewable sources such as hydro and wind power
  - Close proximity to renewable power sources minimizes distribution losses
- **Unique heat re-usage**[1]
  - Heat re-usage system feeds surplus heat into District Heating Plant and a pellet factory, and thereby avoiding huge volumes of emissions
  - Pellet factory uses sawdust and surplus heat to create pellets which is used to warm private houses and businesses not connected to the district heating
- **Additional sustainability initiatives**
  - Reflects construction process and use of wood as primary material (vs. concrete)
  - Sustainability report to customers utilizes Green House Gas Protocol [2] scope 1, 2 and 3

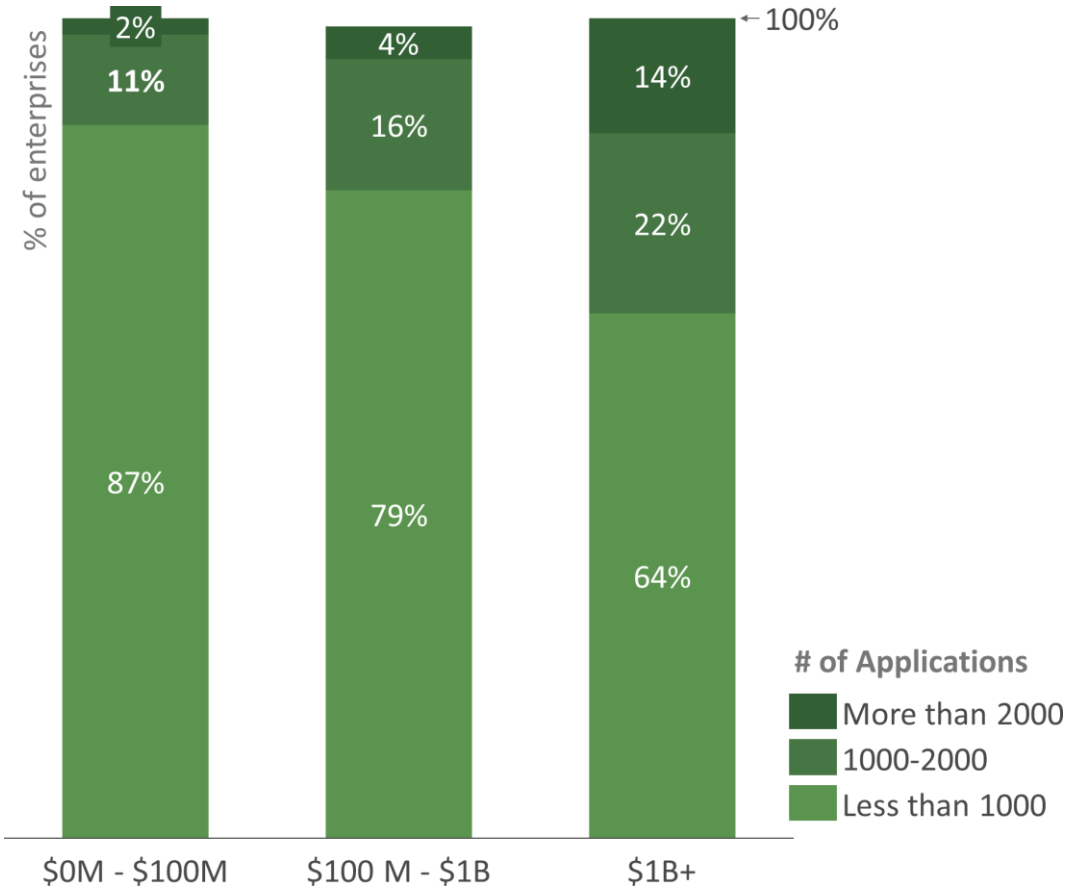




Emissions per kWh	Greenhouse Gas Protocol (GHG)			Total	Avoided emissions	Total
Scope	I	II	III		IV	
Land	-	-	0,0	**0,0**	-	**0,0**
Building	-	-	0,1	**0,1**	-	**0,1**
Tech installation	-	-	1,1	**1,1**	-	**1,1**
Operations	1,3	-	0,9	**2,2**	-	**2,2**
Power	-	10,5	0,0	**10,5**	-	**10,5**
Heat re-usage	1,7	-	-	**1,7**	-48,9	**-47,2**
TOTAL	**3,0**	**10,5**	**2,1**	**15,6**	**-48,9**	**-33,3**

Company	2020 Carbon Footprint (MtCO2e)	Carbon Neutral Target	Net-Zero Carbon Emission Target	Renewable Energy Target	Water Target	Waste Target
Microsoft	13.8	2012	2030	2025	2030	2030
Google	10.3	2007	2030	2030	2030	2030
AWS	60.6	2040	-	2025	-	-
Alibaba	9.51	2030	-	-	-	-
Oracle	80.9	-	2050	2025	-	-
Tencent	5.1	2030	-	2030	-	-
IBM	132.5	-	2030	2030	-	-

Chapter 5: Application & Data



Simplify

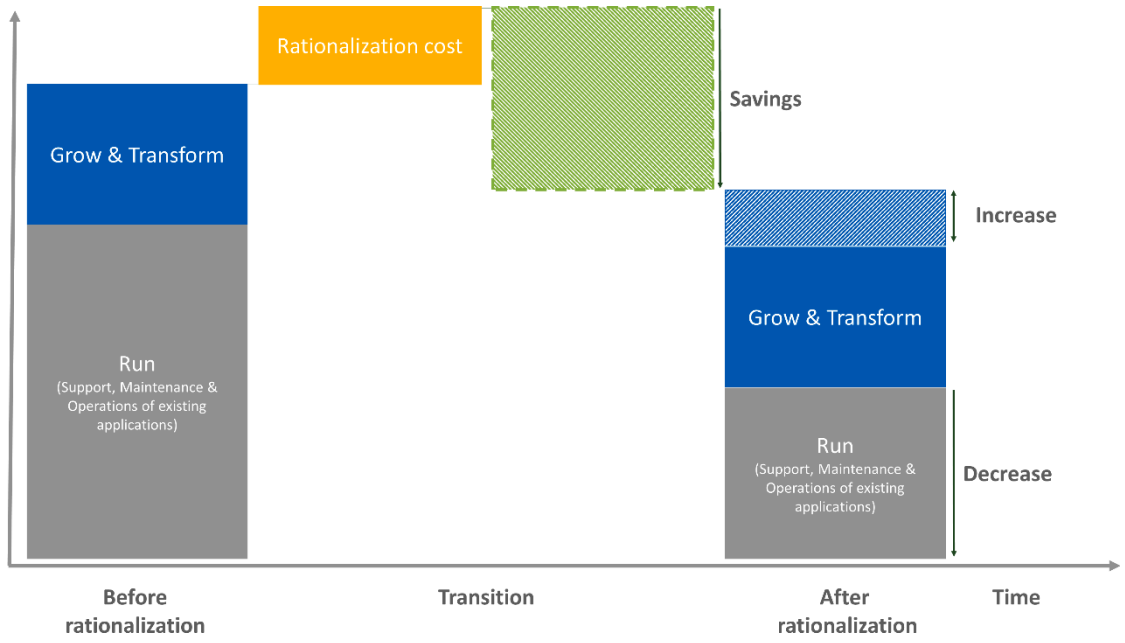
- Create a complete inventory of assets and components
- Align product roadmaps with business objectives
- Eliminate redundancy
- Reduce complexity
- Simplify environment
- Optimize development & support staffing models & skills

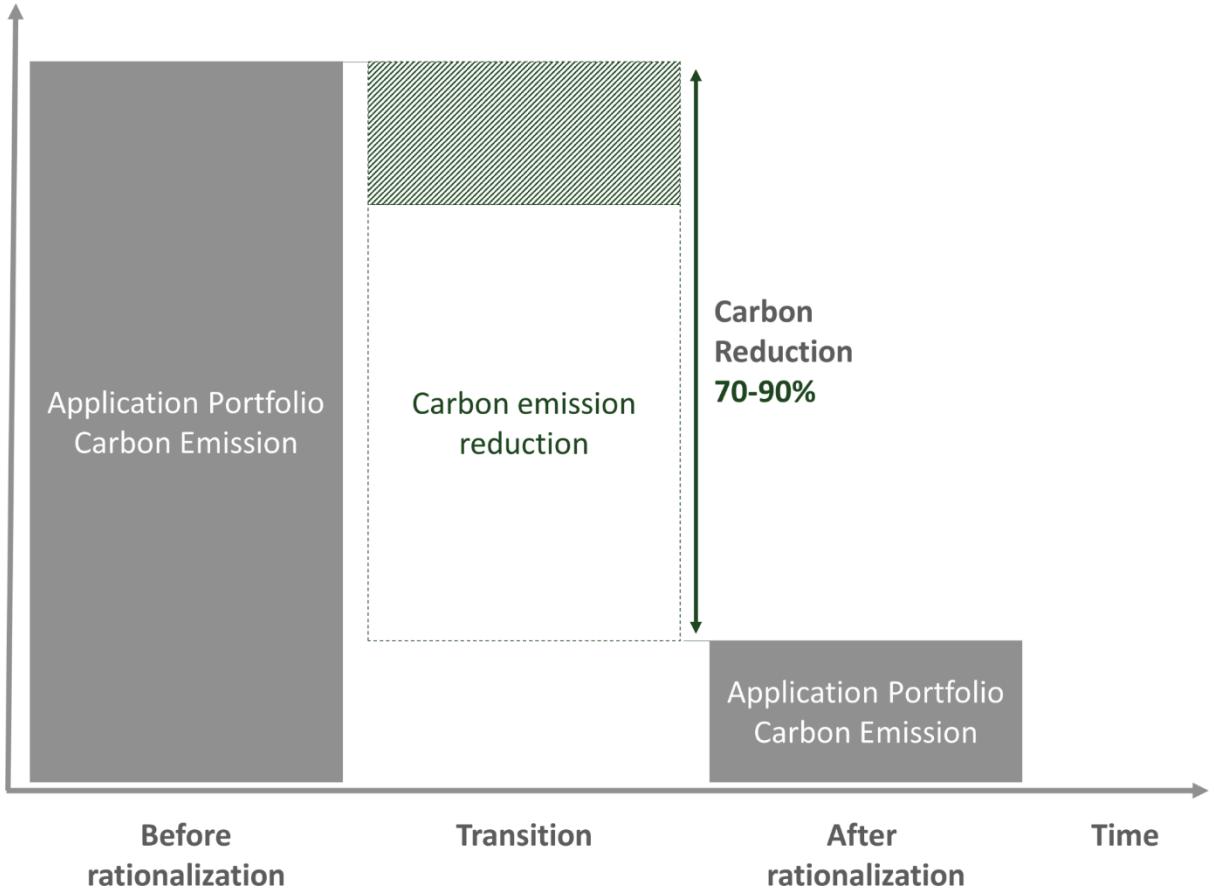
Modernize

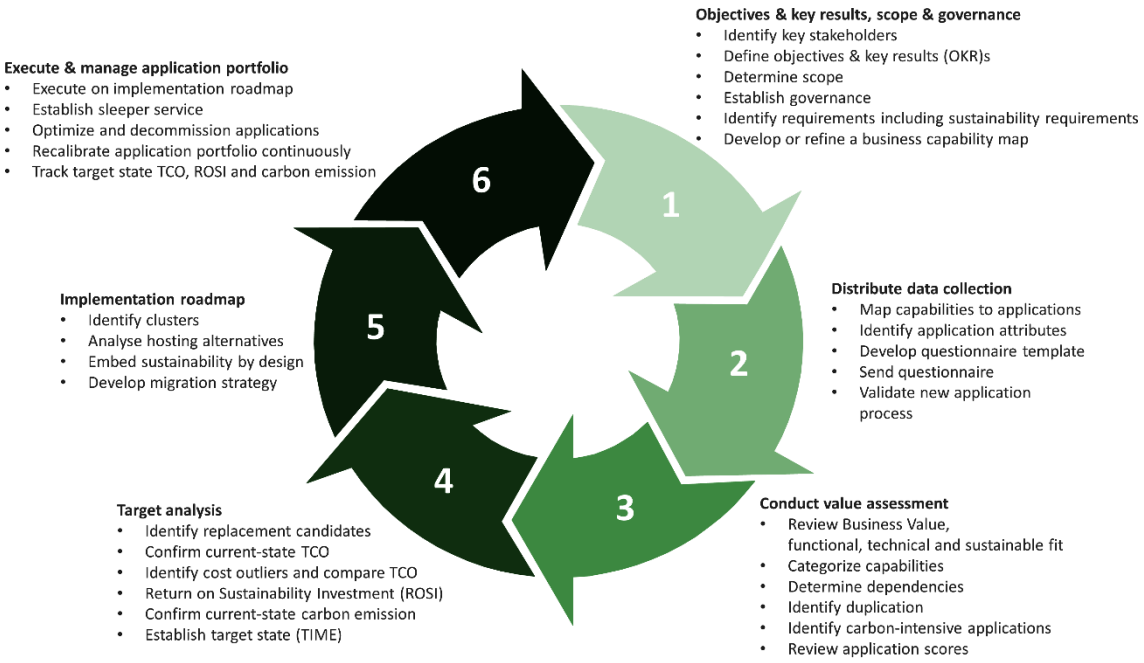
- Standardize architecture and development frameworks
- Determine modernization priorities
- Address security and other risks
- Improve product operating characteristics
- Validate migration plans and roadmaps
- Reduce development & support costs

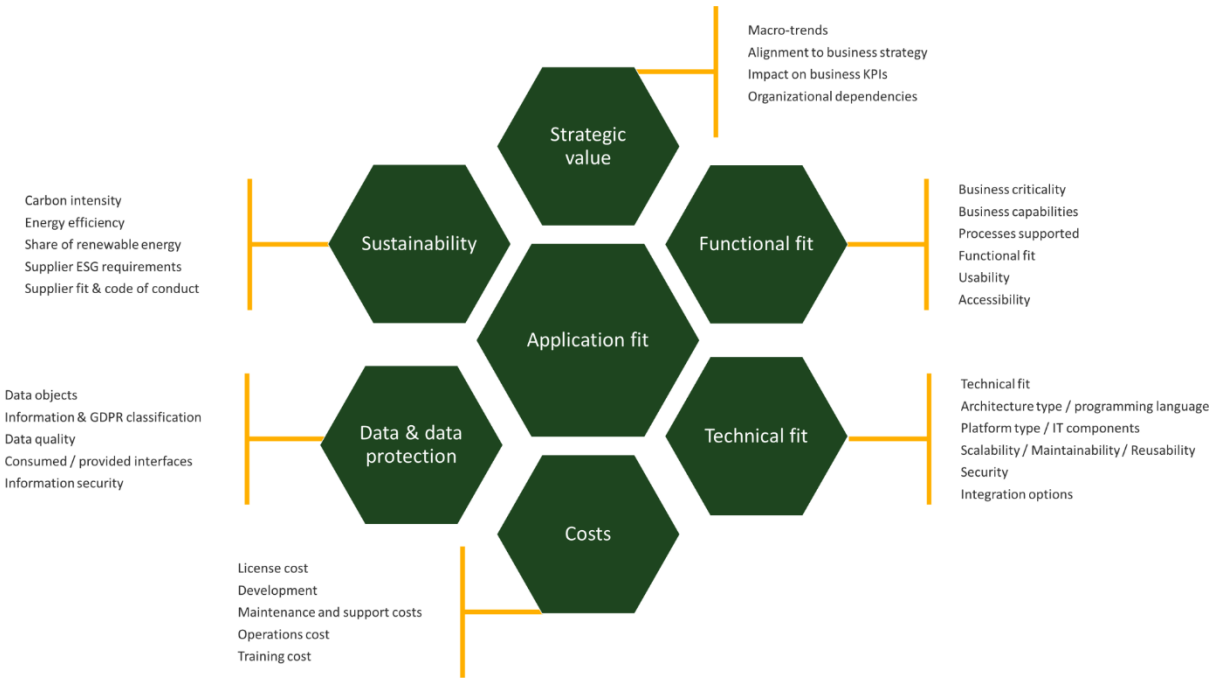
Transform

- Enable businesses to expand and grow
- Improve speed to market
- Increase responsiveness to customer demands
- Increase synergy across product groups
- Increase asset utilization
- Reduce energy consumption & carbon intensity


Rationalization cost
Savings
Grow & Transform
Run
(Support, Maintenance & Operations of existing applications)
Increase
Grow & Transform
Run
(Support, Maintenance & Operations of existing applications)
Decrease
Before rationalization
Transition
After rationalization
Time


Application Portfolio Carbon Emission
Carbon emission reduction
Carbon Reduction 70-90%
Application Portfolio Carbon Emission
Before rationalization
Transition
After rationalization
Time

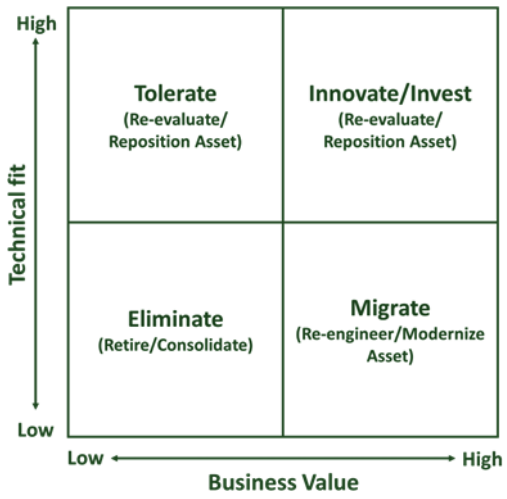


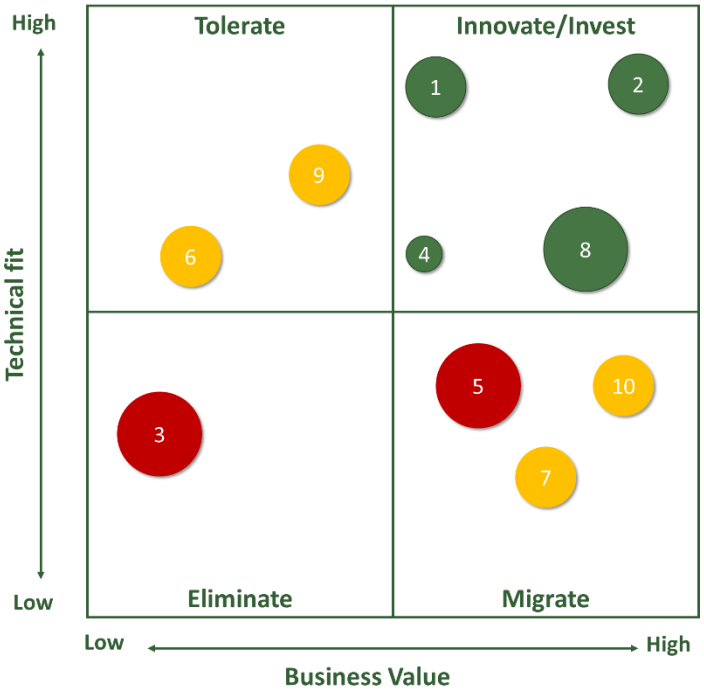


Application ID	1	2	3	4	5
Application Name	ERP 1 – Finance & Operations	Sales & Service Ecosystem	Legacy ERP 2 - Finance	E-Commerce Platform	CRM Legacy application
Business criticality	Business critical	Business operational	Business operational	Mission critical	Administrative service
Business capabilities	Finance, manufacturing & logistics	Sales, marketing, customer service & field service	Finance	Sales & customer service	Sales
Processes supported	Order to cash, procure to pay, forecast to plan, plan to produce, record to report & acquire to retire	Quote to cash & service to cash	Record to report & acquire to retire	Quote to cash	Quote to cash
Functional fit	Perfect	Appropriate	Unreasonable	Appropriate	Insufficient
Usability	Appropriate	Perfect	Unresonable	Appropriate	Insufficient
Accessibility	Appropriate	Appropriate	Insufficient	Appropriate	Insufficient

Application ID	1	2	3	4	5
Application Name	ERP 1 – Finance & Operations	Sales & Service Ecosystem	Legacy ERP 2 - Finance	E-Commerce Platform	CRM Legacy application
Application Type	SaaS	SaaS	Client Server	Client Server	Client Server
Application Platform	SAP S/4 Hana	Salesforce	ECC 4.0	IBM WebSphere Commerce 7.0	CRM Dynamics 2011
Database	N/A	N/A	Oracle DB	IBM DB2	MSSQL 2008 R2
Middleware	N/A	N/A	Oracle SOA Suite	BizTalk 2016	BizTalk 2016
Operating System	N/A	N/A	Suse Linux	Suse Linux	Windows Server 2011
Hardware	N/A	N/A	Dell XPS, i7 2-core	Dell PowerEdge M640P	Dell XPS, i7 2-core
Cloud Provider	Community Cloud	Community Cloud	Private Cloud	Private Cloud	Private Cloud

Application ID	1	2	3	4	5
Application Name	ERP 1 – Finance & Operations	Sales & Service Ecosystem	Legacy ERP 2 - Finance	E-Commerce Platform	CRM Legacy application
Carbon intensity	High	Medium	High	Medium	High
Energy efficiency	Appropriate	Appropriate	Unreasonable	Insufficient	Unreasonable
Share of renewable energy	100%	100%	0%	100%	0%
Supplier fit	Strategic	Strategic	Exit	Tactical	Exit
Code of conduct	Signed	Signed	Not signed	Signed	Not signed
ESG requirements met	Partially	Met	Not met	Partially	Not met



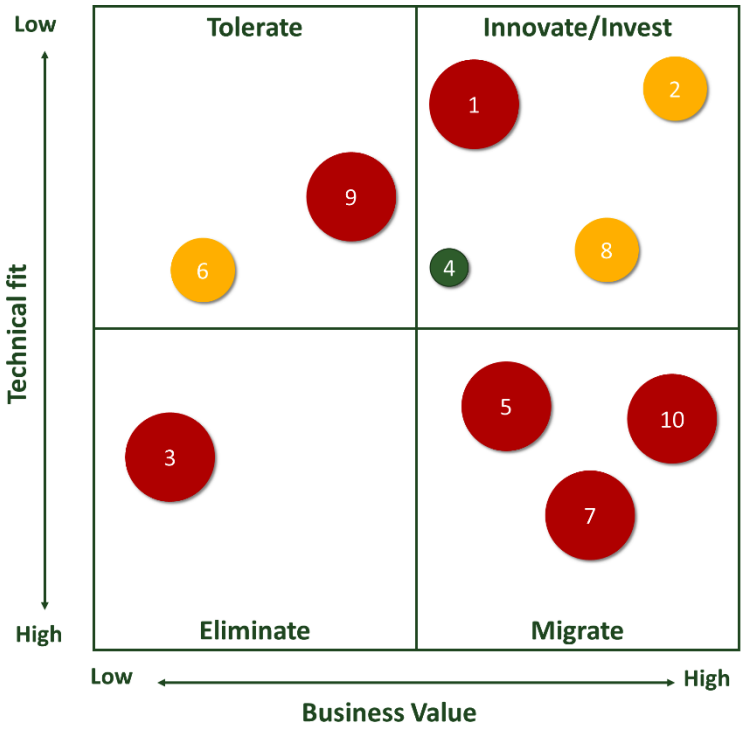


Legend

1. ERP 1 – Finance & Operations
2. Sales & Service Ecosystem
3. Legacy ERP 2 - Finance
4. E-commerce Platform
5. CRM Legacy application
6. Business Partner Portal
7. Legacy BI Platform
8. Data & Analytics Platform
9. HRIS Application
10. Legacy Finance Application

Application Costs

< 100 kEUR < 500 kEUR > 500 kEUR

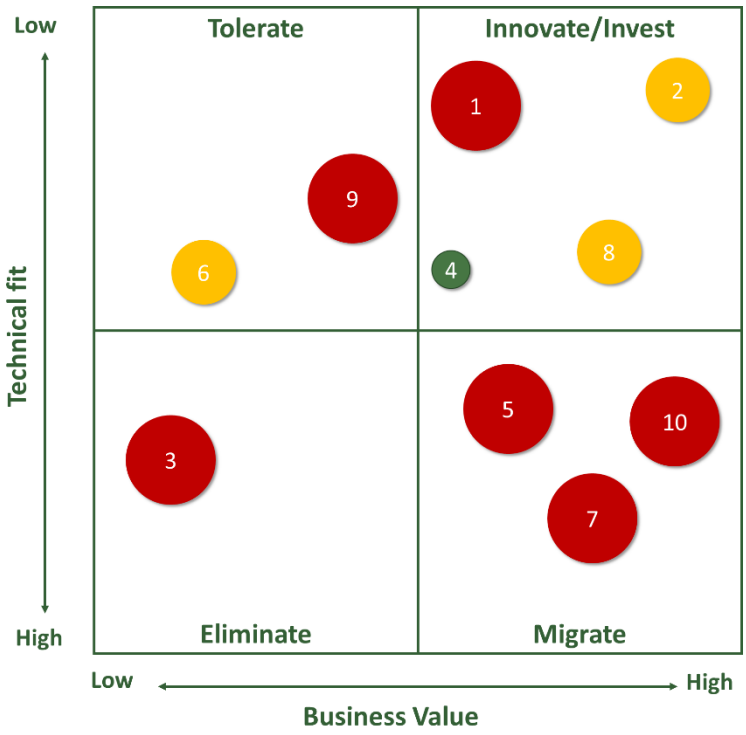


Legend

1. ERP 1 – Finance & Operations
2. Sales & Service Ecosystem
3. Legacy ERP 2 - Finance
4. E-commerce Platform
5. CRM Legacy application
6. Business Partner Portal
7. Legacy BI Platform
8. Data & Analytics Platform
9. HRIS Application
10. Legacy Finance Application

Carbon emission

< 1 $MTCO_2e$ < 5 $MTCO_2e$ > 5 $MTCO_2e$



Legend

1. ERP 1 – Finance & Operations
2. Sales & Service Ecosystem
3. Legacy ERP 2 - Finance
4. E-commerce Platform
5. CRM Legacy application
6. Business Partner Portal
7. Legacy BI Platform
8. Data & Analytics Platform
9. HRIS Application
10. Legacy Finance Application

Carbon emission cost

< €100 < €500 > €500

Imperative

- Ada
- C
- C++
- F#
- Fortran
- Go
- OCaml
- Pascal
- Rust

Object-oriented

- Ada
- C++
- C#
- Chapel
- Dart
- F#
- Java
- JavaScript
- OCaml
- Perl
- PHP
- Python
- Racket
- Rust
- Smalltalk
- Swift
- TypeScript

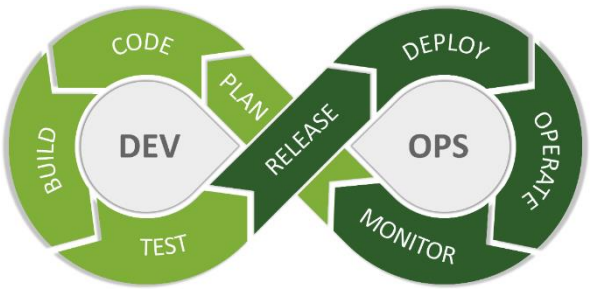
Functional

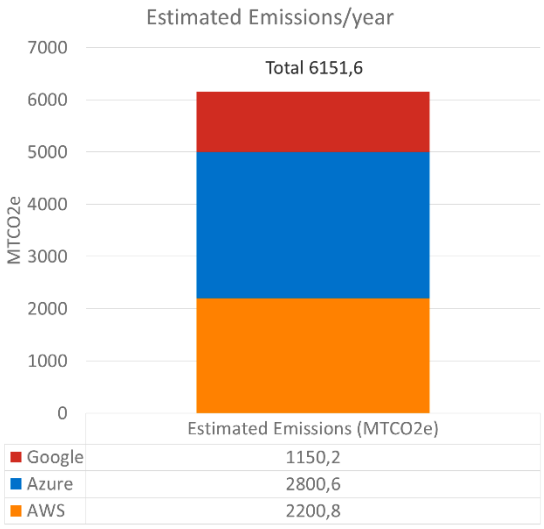
- Erlang
- F#
- Haskell
- Lisp
- OCaml
- Perl
- Racket
- Ruby
- Rust

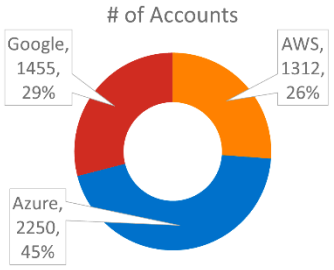
Scripting

- Dart
- Hack
- JavaScript
- JRuby
- Lua
- Perl
- Python
- Ruby
- TypeScript

Time & Memory	Energy & Time	Energy & Memory	Energy, Time & Memory
C | Pascal | Go	C	C | Pascal	C | Pascal | Go
Rust | C++ | Fortran	Rust	Rust | C++ | Fortran | Go	Rust | C++ | Fortran
Ada	C++	Ada	Ada
Java | Chapel | Lisp | OCaml	Ada	Java | Chapel | Lisp	Java | Chapel | Lisp | Ocaml
Haskell | C#	Java	OCaml | Swift | Haskell	Swift | Haskell | C#
Swift | PHP	Pascal | Chapel	C# | PHP	Dart | F# | Racket | Hack | PHP
F# | Racket | Hack | Python	Lisp | OCaml | Go	Dart | F# | Racker | Hack | Python	JavaScript | Ruby | Python
JavaScript | Ruby	Fortran | Haskell | C#	JavaScript | Ruby	TypeScript | Erlang
Dart | TypeScript | Erlang	Swift	TypeScript	Lua | JRuby | Perl
JRuby | Perl	Dart | F#	Erlang | Lua | Perl	
Lua	JavaScript	JRuby	
	Racket		
	TypeScript | Hack		
	PHP		
	Erlang		
	Lua | JRuby		
	Ruby		



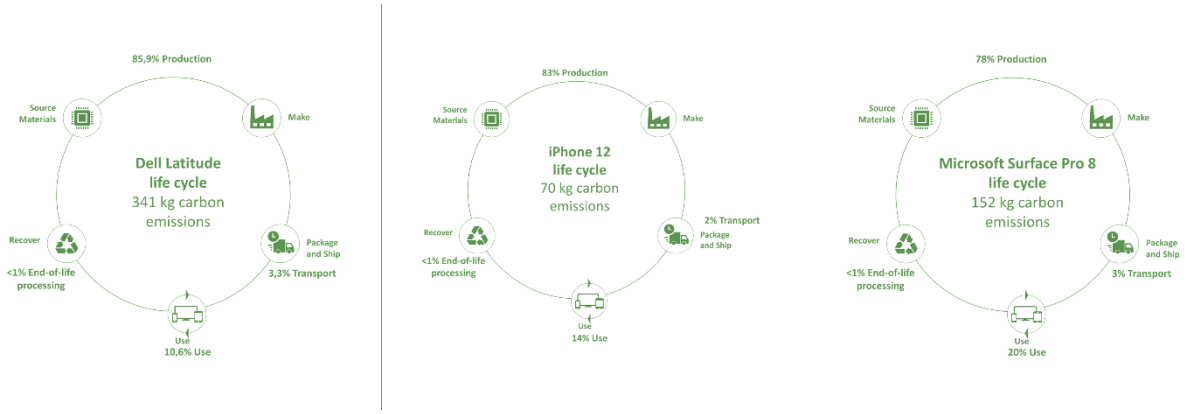


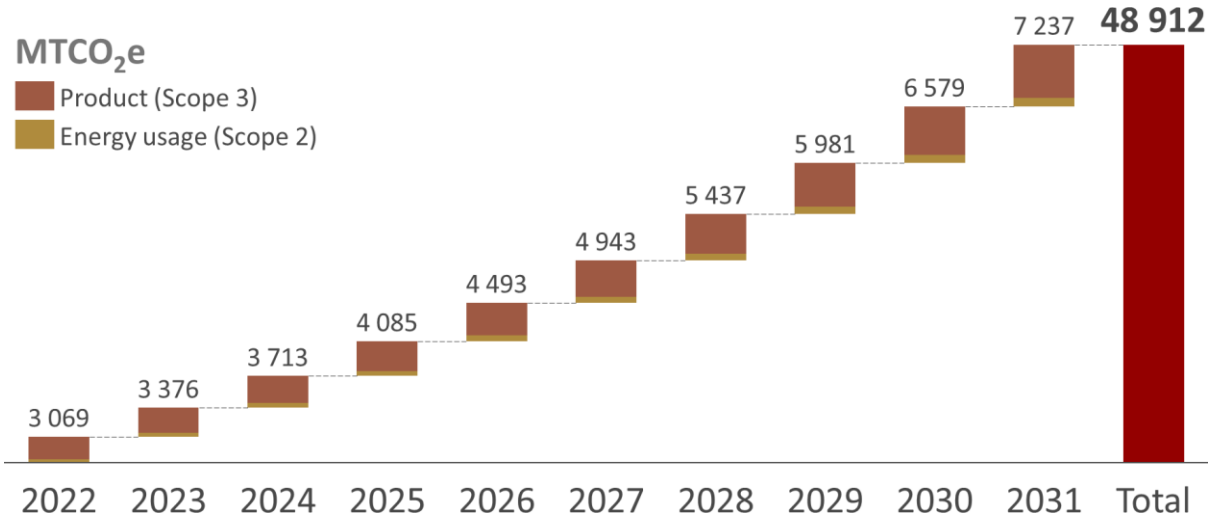


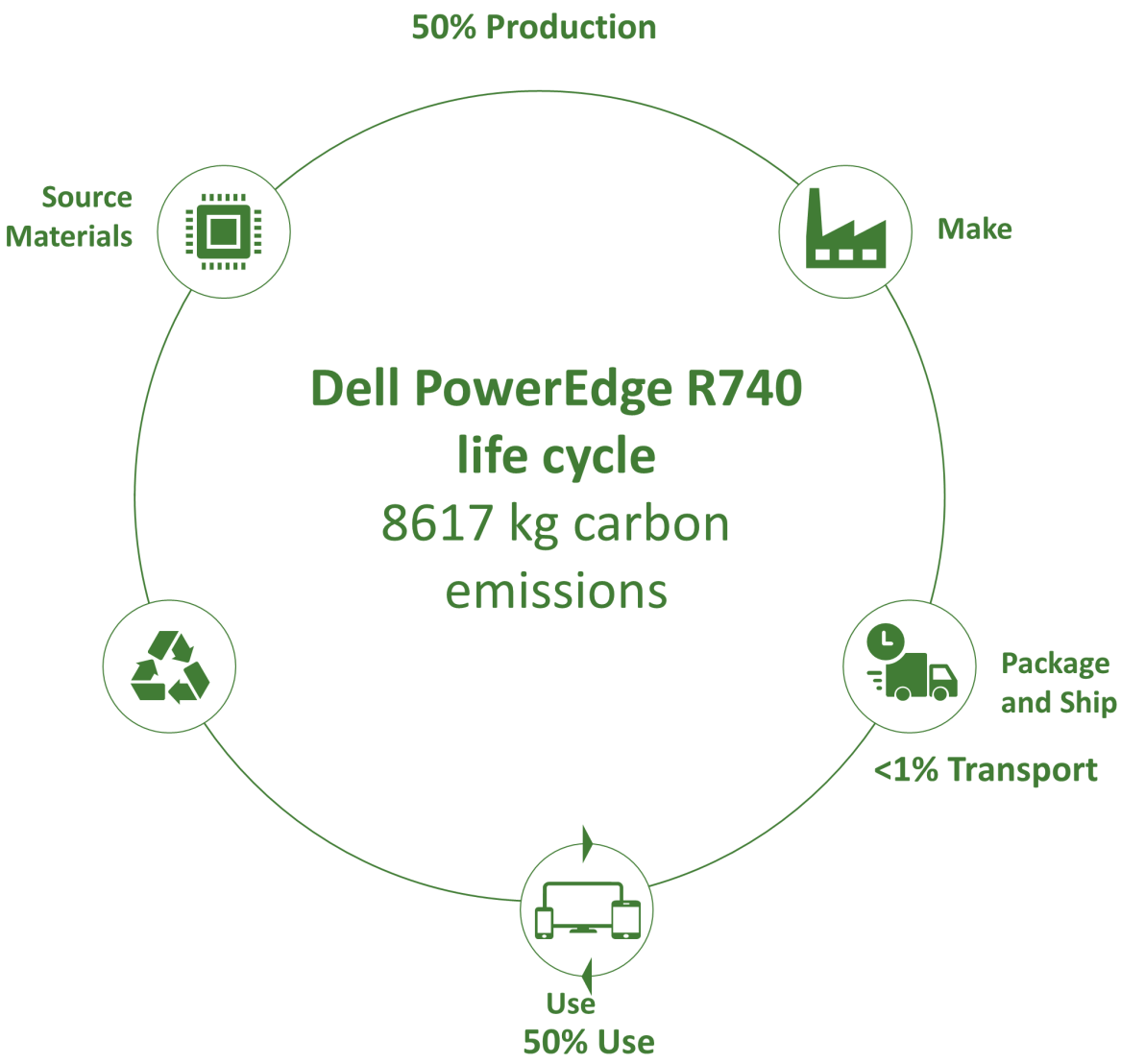
Emission Intensity per Account

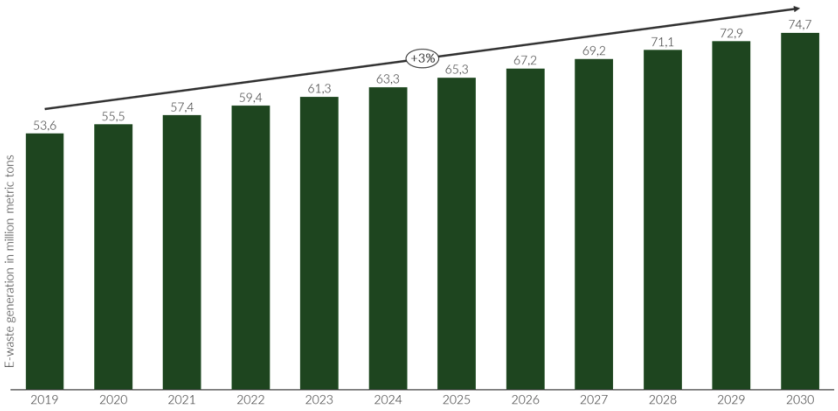
Provider	Emissions (MTCO2e)	# of Accounts	Emission Intensity / Account
AWS	2200,8	1312	1,68
Azure	2800,6	2250	1,24
Google	1150,2	1455	0,79

Chapter 6: IT Hardware Management

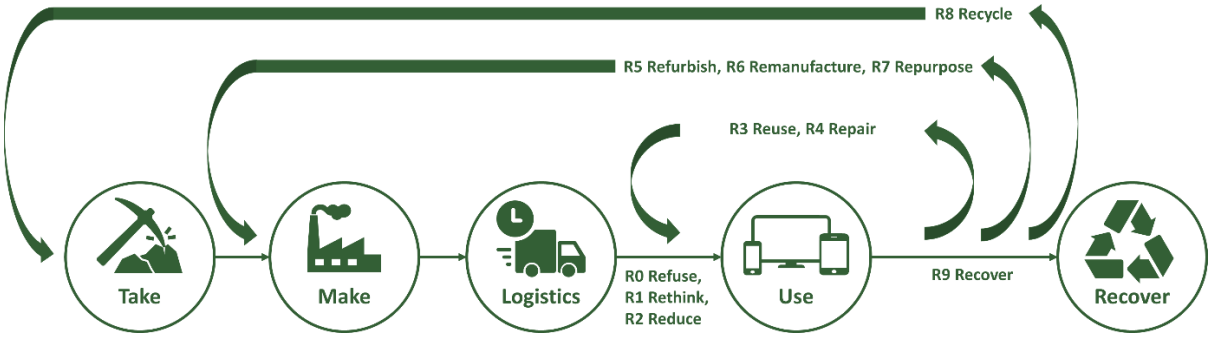


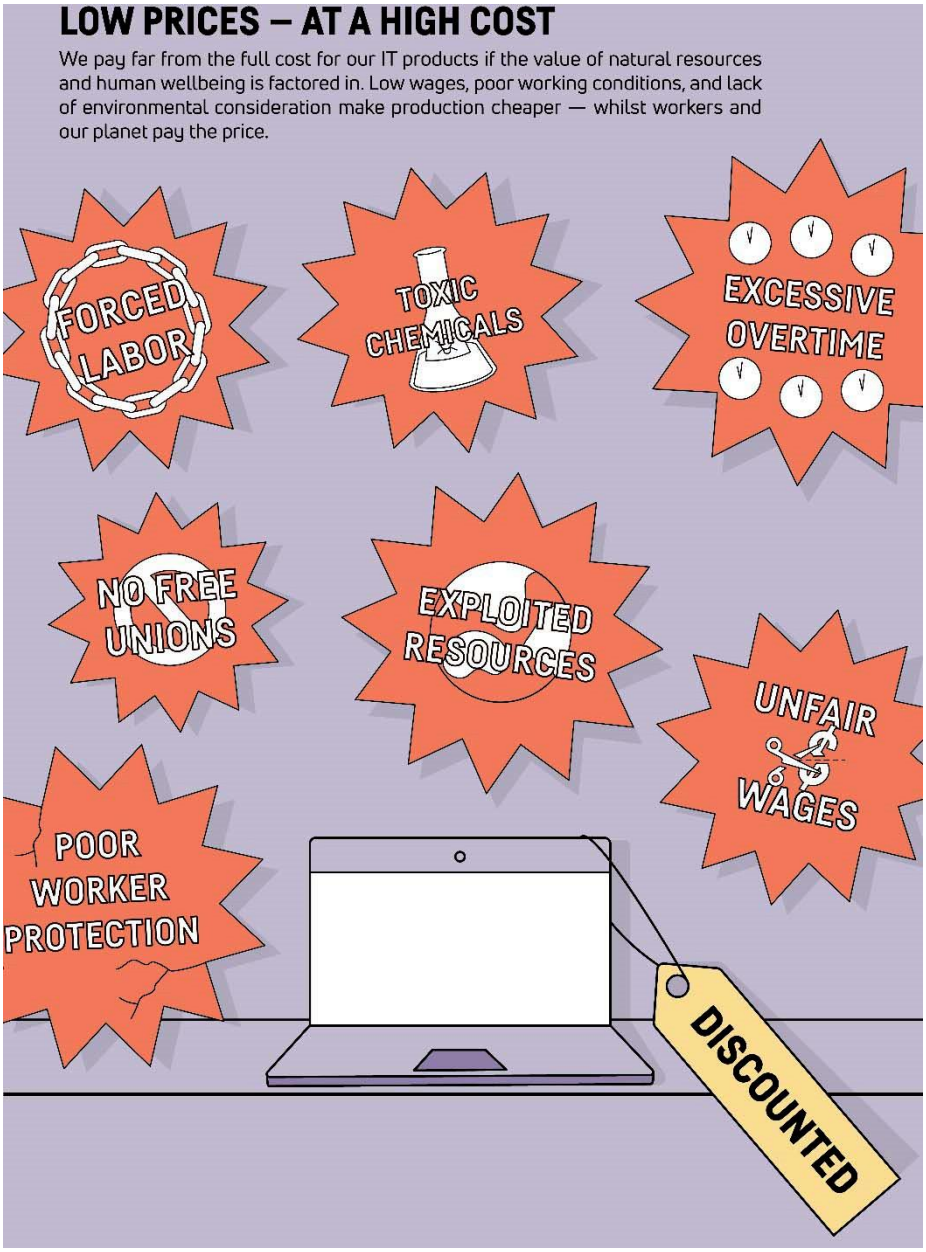


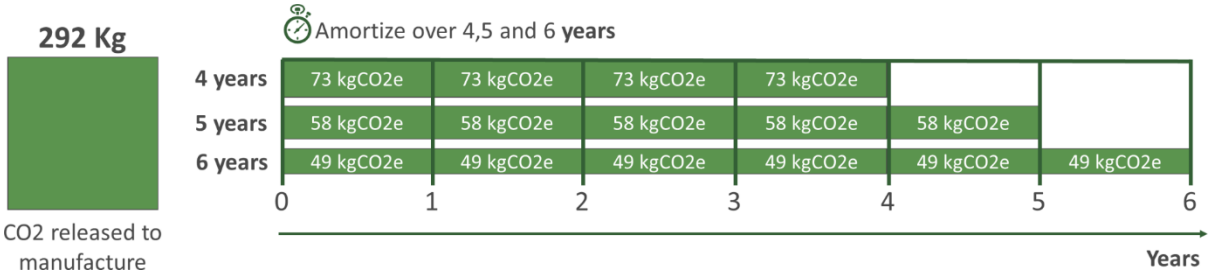


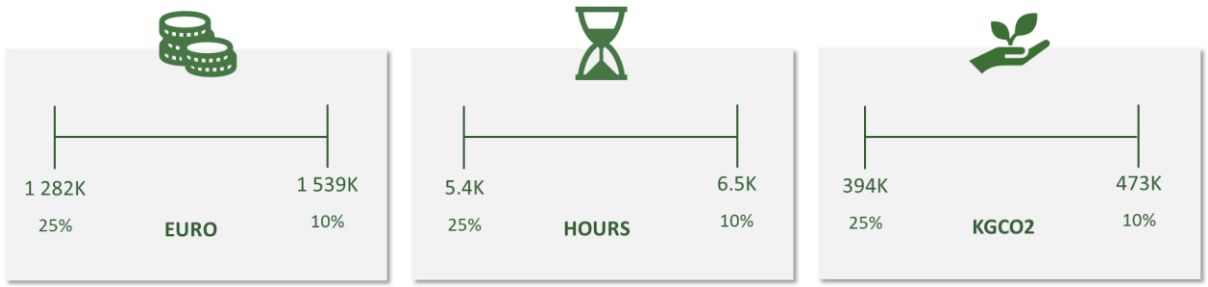


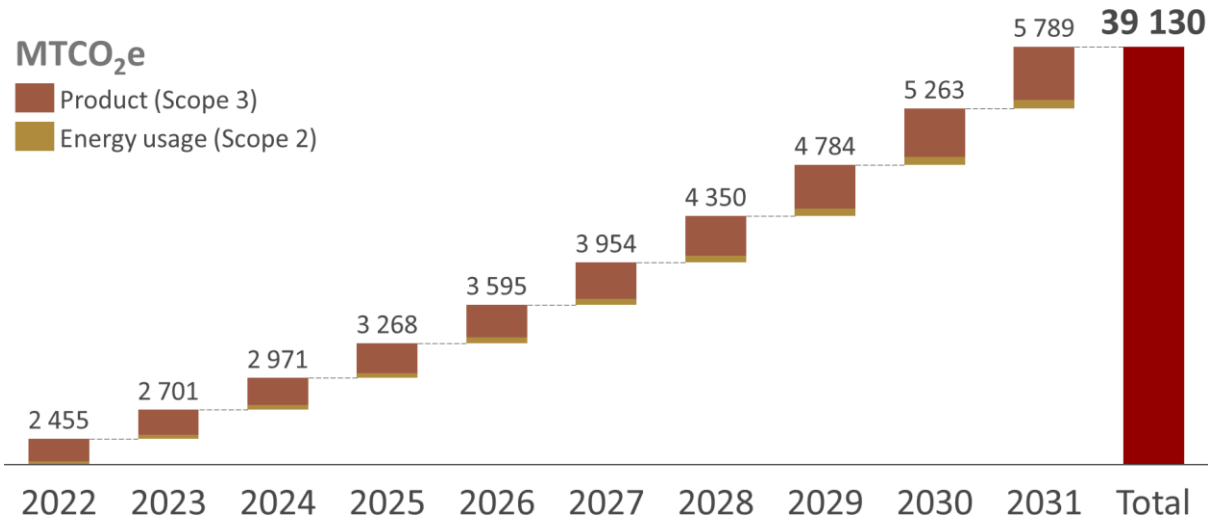
Source: Statista 2022

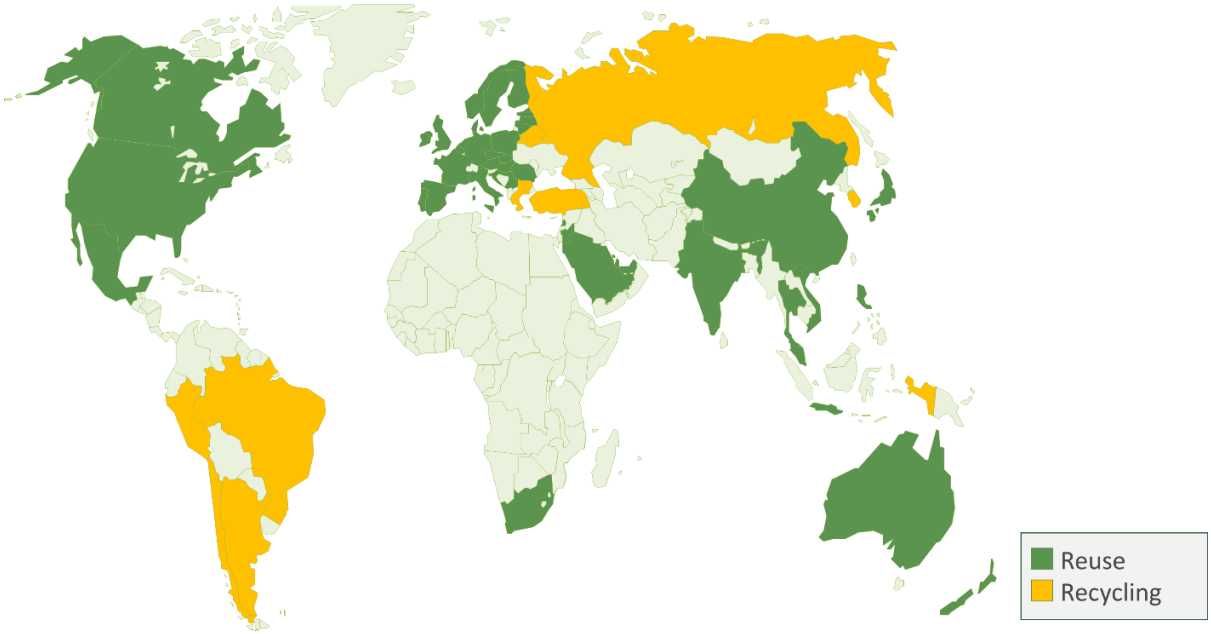

R8 Recycle
R5 Refurbish, R6 Remanufacture, R7 Repurpose
R3 Reuse, R4 Repair
Take
Make
Logistics
R0 Refuse,
R1 Rethink,
R2 Reduce
Use
R9 Recover
Recover

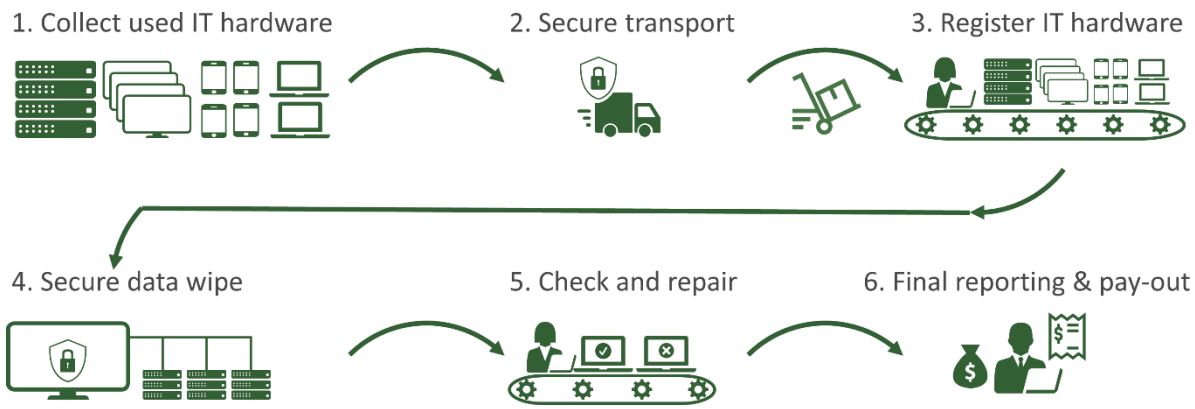

LOW PRICES – AT A HIGH COST
We pay far from the full cost for our IT products if the value of natural resources and human wellbeing is factored in. Low wages, poor working conditions, and lack of environmental consideration make production cheaper — whilst workers and our planet pay the price.
FORCED LABOR
TOXIC CHEMICALS
EXCESSIVE OVERTIME
NO FREE UNIONS
EXPLOITED RESOURCES
UNFAIR WAGES
POOR WORKER PROTECTION
DISCOUNTED

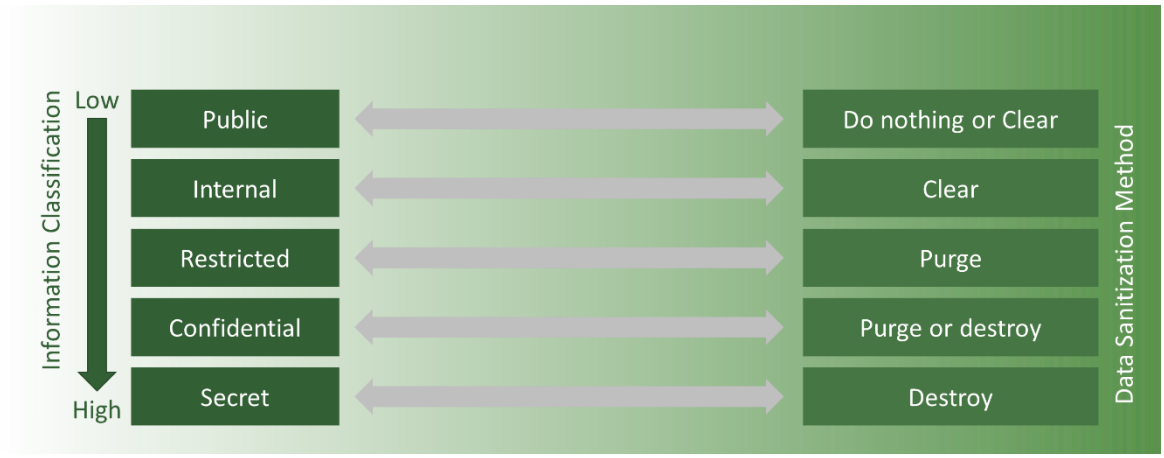

292 Kg
CO2 released to manufacture
Amortize over 4,5 and 6 years
4 years
5 years
6 years
73 kgCO2e
58 kgCO2e
49 kgCO2e
0
1
2
3
4
5
6
Years


1 282K
25%
EURO
1 539K
10%
5.4K
25%
HOURS
6.5K
10%
394K
25%
KGCO2
473K
10%


MTCO2e
Product (Scope 3)
Energy usage (Scope 2)
2 455
2 701
2 971
3 268
3 595
3 954
4 350
4 784
5 263
5 789
39 130
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
Total


Reuse
Recycling


1. Collect used IT hardware
2. Secure transport
3. Register IT hardware
4. Secure data wipe
5. Check and repair
6. Final reporting & pay-out

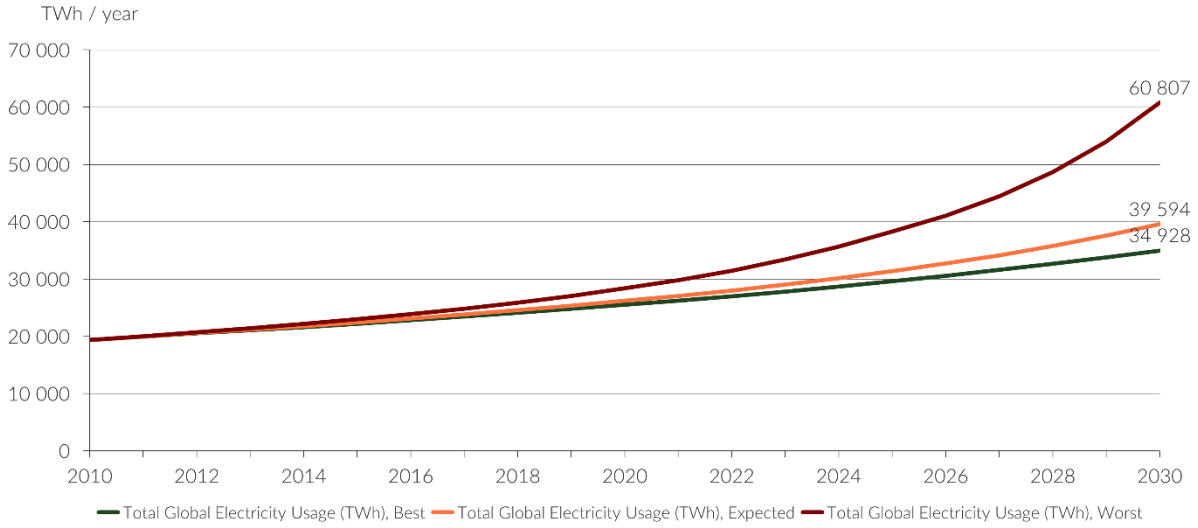

Information Classification
Low
High
Public
Internal
Restricted
Confidential
Secret
Do nothing or Clear
Clear
Purge
Purge or destroy
Destroy
Data Sanitization Method

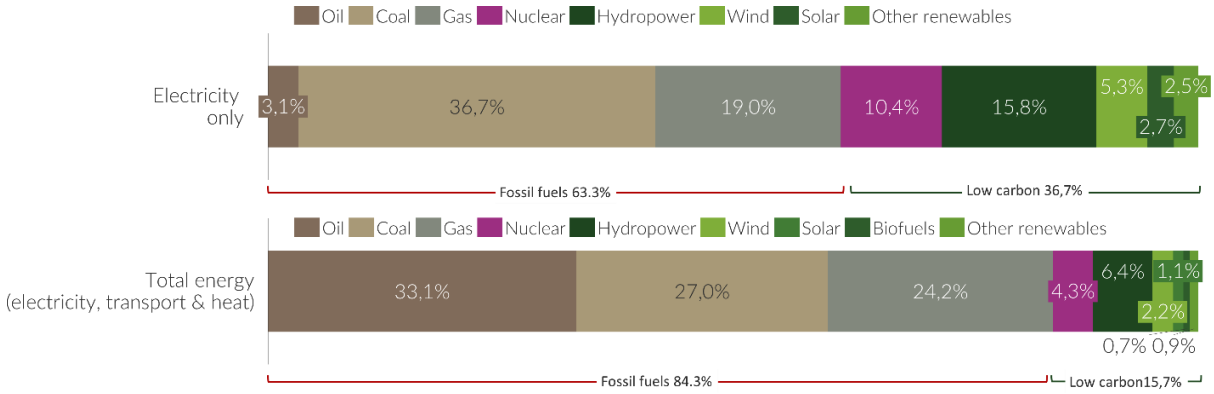
Company	2020 Carbon Footprint (MtCO2e)	Carbon Neutral Target	Net-Zero Carbon Emission Target	Renewable Energy Target	Water Target	Waste Target
Lenovo	150	-	2050	-	-	-
HP	44.9	2025	2040	2040	-	2025
Dell	298.5	-	2050	2040	-	-
Apple	22.6	2020	2030	2020	-	-
Acer	12.2	-	2050*	2025	-	-
Asus	1,221.3	-	-	2035	-	-

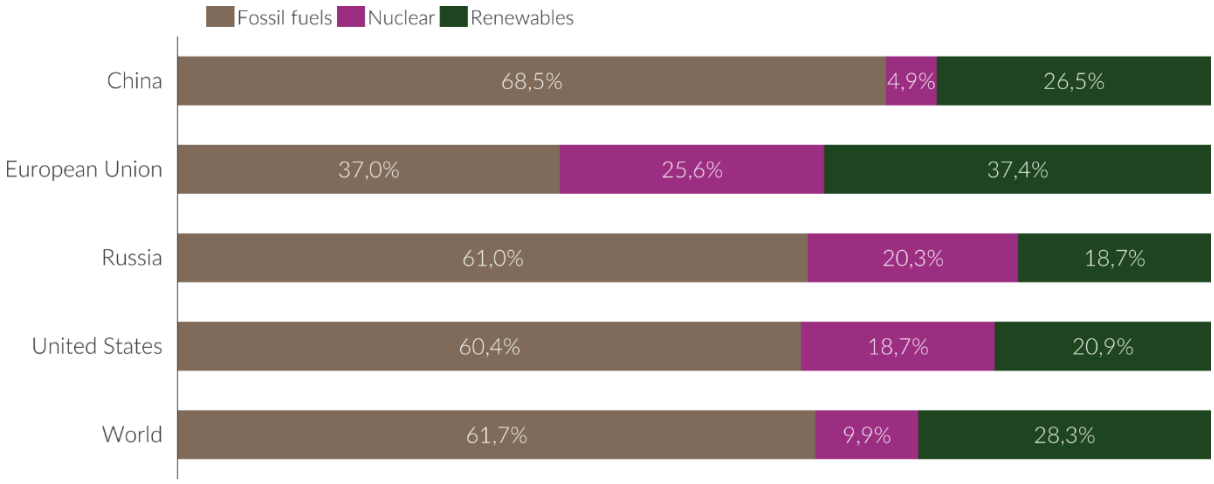
Scope 1 & 2 only, *80 percent by 2050

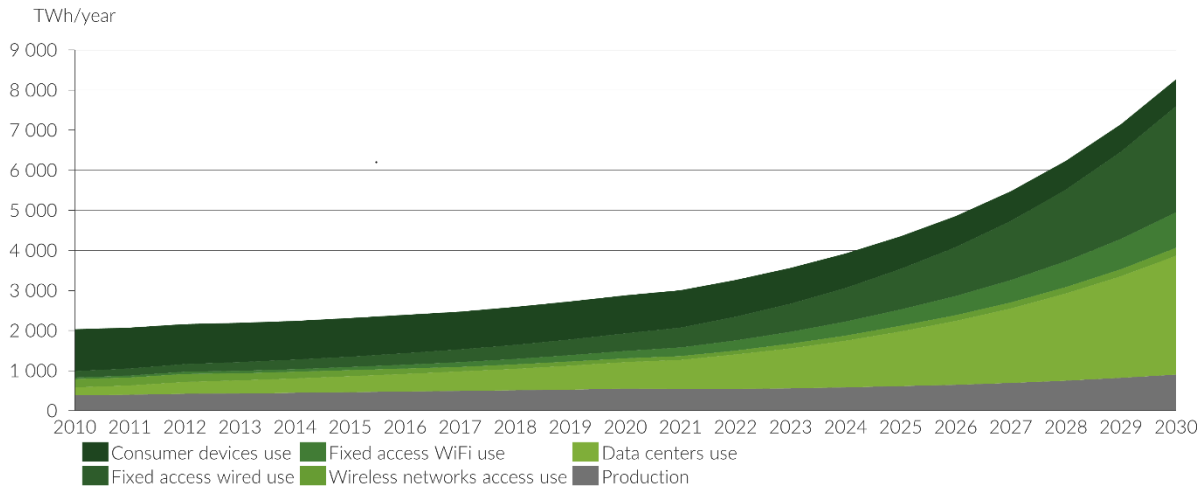
Description	Metric	General Requirement	United Nations Sustainable Development Goals Alignment
Equipment lifetime	Years	Equipment lifetime years	12. Responsible Consumption and Production 13. Climate Action
Renewable energy	%	**REF** Renewable Energy Factor	9. Industry, Innovation and Infrastructure 12. Responsible Consumption and Production
Circular economy reuse and repair	%	**Reuse and Repair** % equipment reused	12. Responsible Consumption and Production 13. Climate Action
Zero waste to landfill	WUE	**Recycle** % equipment reused	12. Responsible Consumption and Production 13. Climate Action
Hazardous substances	%	**Hazardous Substances** % equipment with hazardous substances	12. Responsible Consumption and Production 13. Climate Action

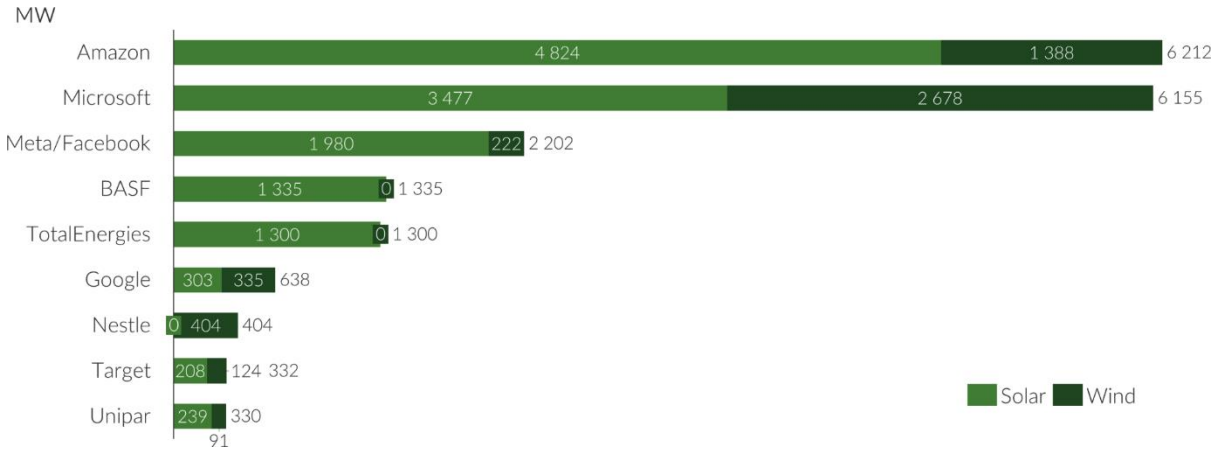
Chapter 7: Power Energy Management











$$\left(\left[\frac{the\ capacity\ of\ appliance\ expressed\ in\ watt}{1000}\right]\right) \times [\#\ of\ hours'use] \times [\#\ of\ days'use] = \#\ of\ kWh$$

$$[number\ of\ kWh] \times [carbon\ intensity\ MTCO2/kWh] = carbon\ emission\ MtCO2$$

$$\frac{Carbon\ emission\ MtCO2}{0.011\ MtCO2\ tree\ year} = \#\ trees\ per\ year\left(\left[\frac{50}{1000}\right]\right) \times [8] \times [275] = 110\ kWh$$

$$\left(\left[\frac{100}{1000}\right]\right) \times [8] \times [275] = 220\ kWh 110\ kWh \times 0.000475\ \text{MtCO2/kWh} = 0.05\ MtCO2$$

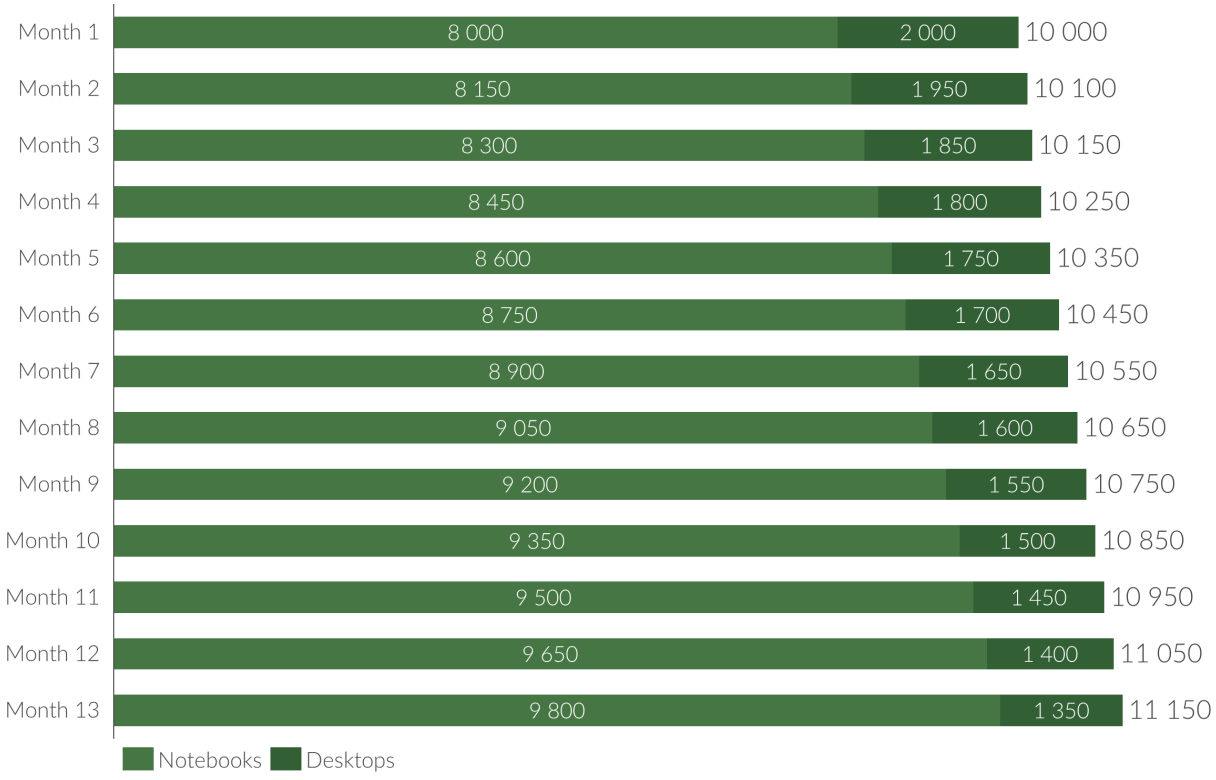
$$200\ kWh \times 0.000475\ \text{MtCO2/kWh} = 0.10\ MtCO2 \frac{0.05}{0.011} = 4.5\ trees\ per\ year$$

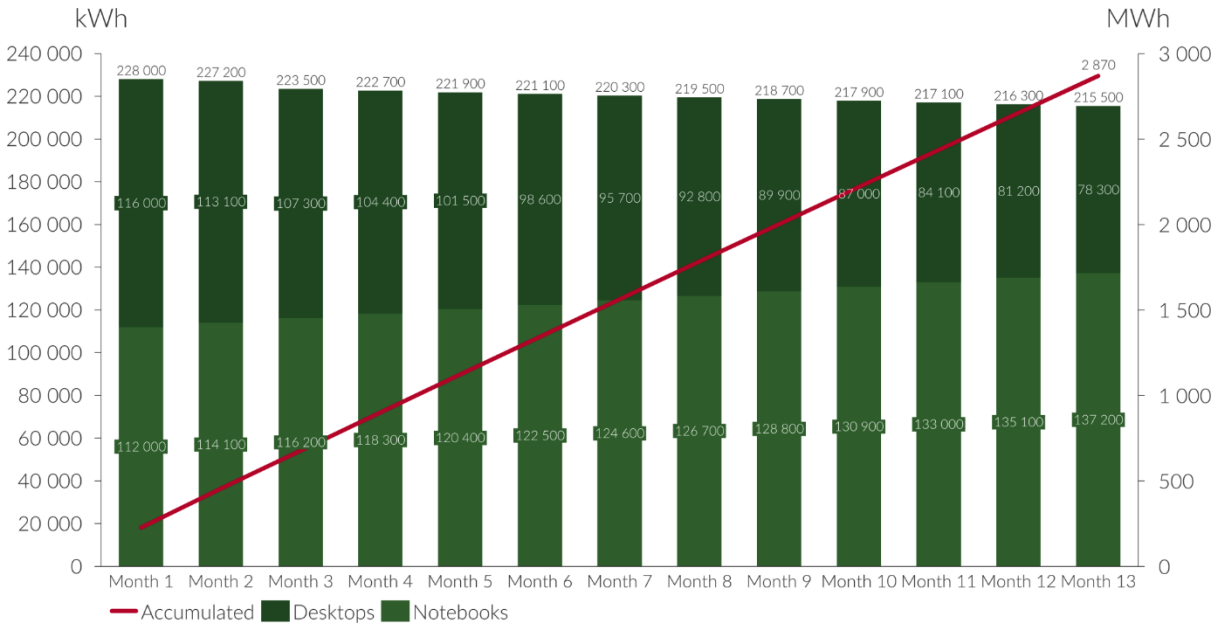
$$\frac{0.10}{0.011} = 9\ trees\ per\ year\left(\left[\frac{200}{1000}\right]\right) \times [8] \times [275] = 440\ kWh$$

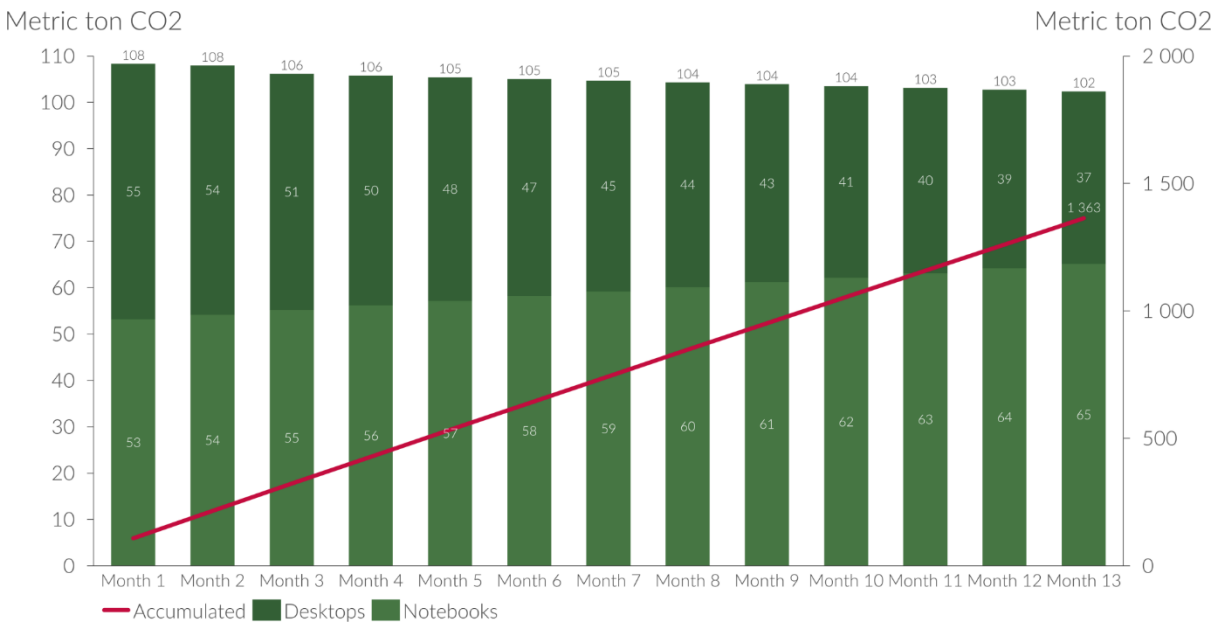
$$440\ kWh \times 0{,}000475\ \mathrm{MtCO2/kWh} = 0.21\ MtCO2 \frac{0.21}{0.011} = 19\ trees\ per\ year$$

$$\left(\left[\frac{300}{1000}\right]\right) \times [24] \times [365]\ X\ [80\%] = 2\ 102\ kWh$$

$$2\ 102\ kWh \times 0.000475\ \frac{\mathrm{MtCO2}}{\mathrm{kWh}} = 0.999\ MtCO2 = 1.0\ MtCO2 \frac{1.0}{0.011} = 91\ trees\ per\ year$$







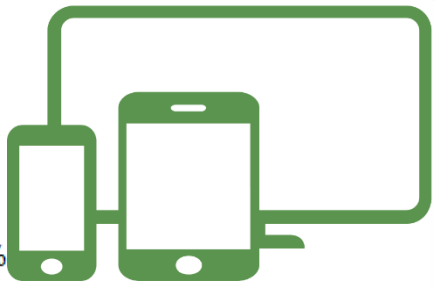
$$\left(\left[\frac{100}{1000}\right]\right) \times [8] \times [275] \times 2{,}700{,}000{,}000 = 594{,}000{,}000{,}000\ kWh\ (kilowatt\ hours)$$
$$= 594{,}000{,}000\ MWh\ (megawatt\ hours) = 594\,000\ GWh\ (gigawatt\ hours)$$
$$= 594\ TWh\ (terawatt\ hours)$$

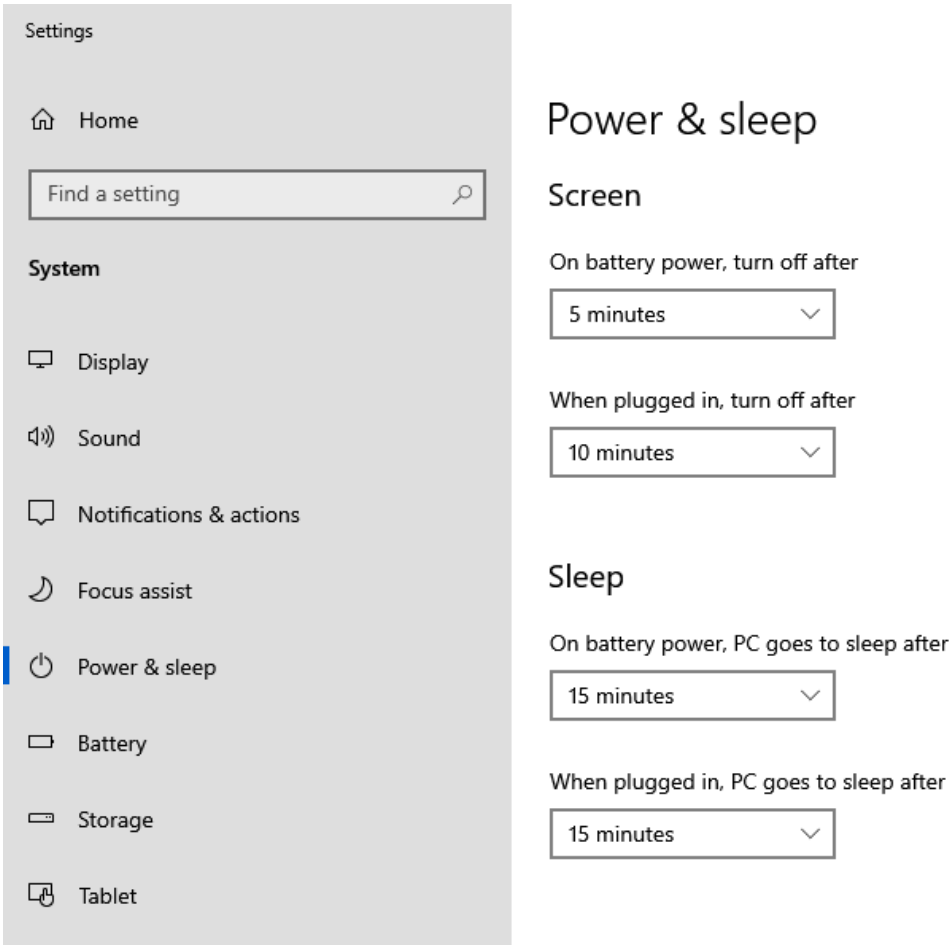
2.7 billion computers’
annual electricity usage
594 TWh

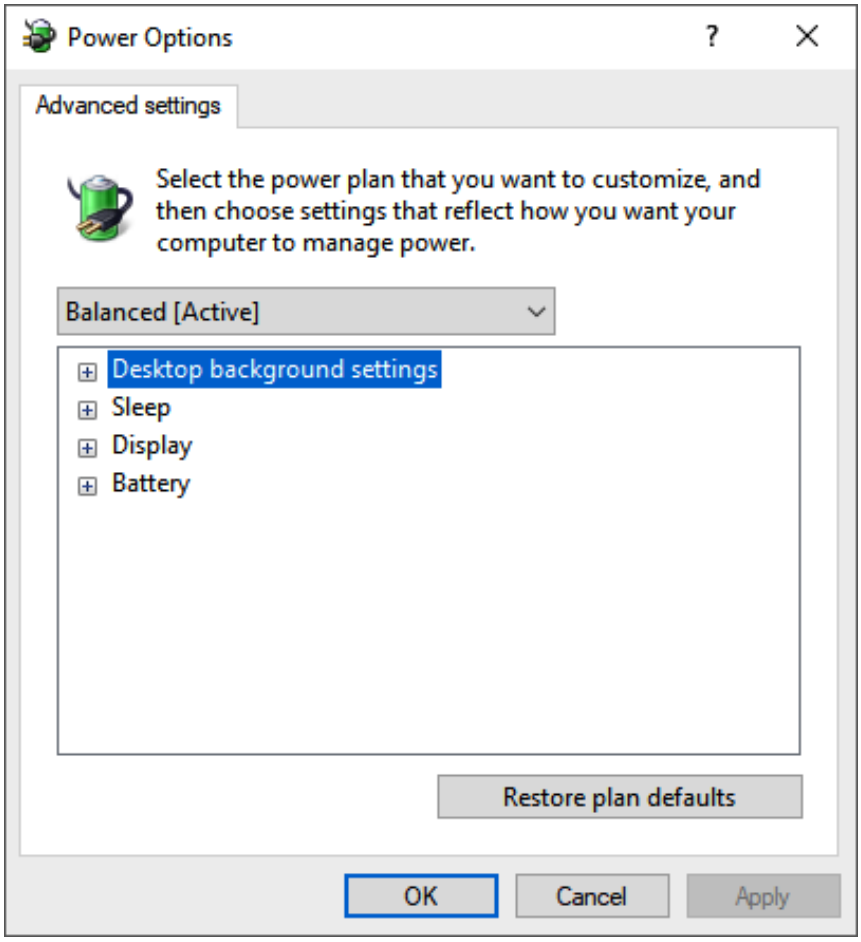
=

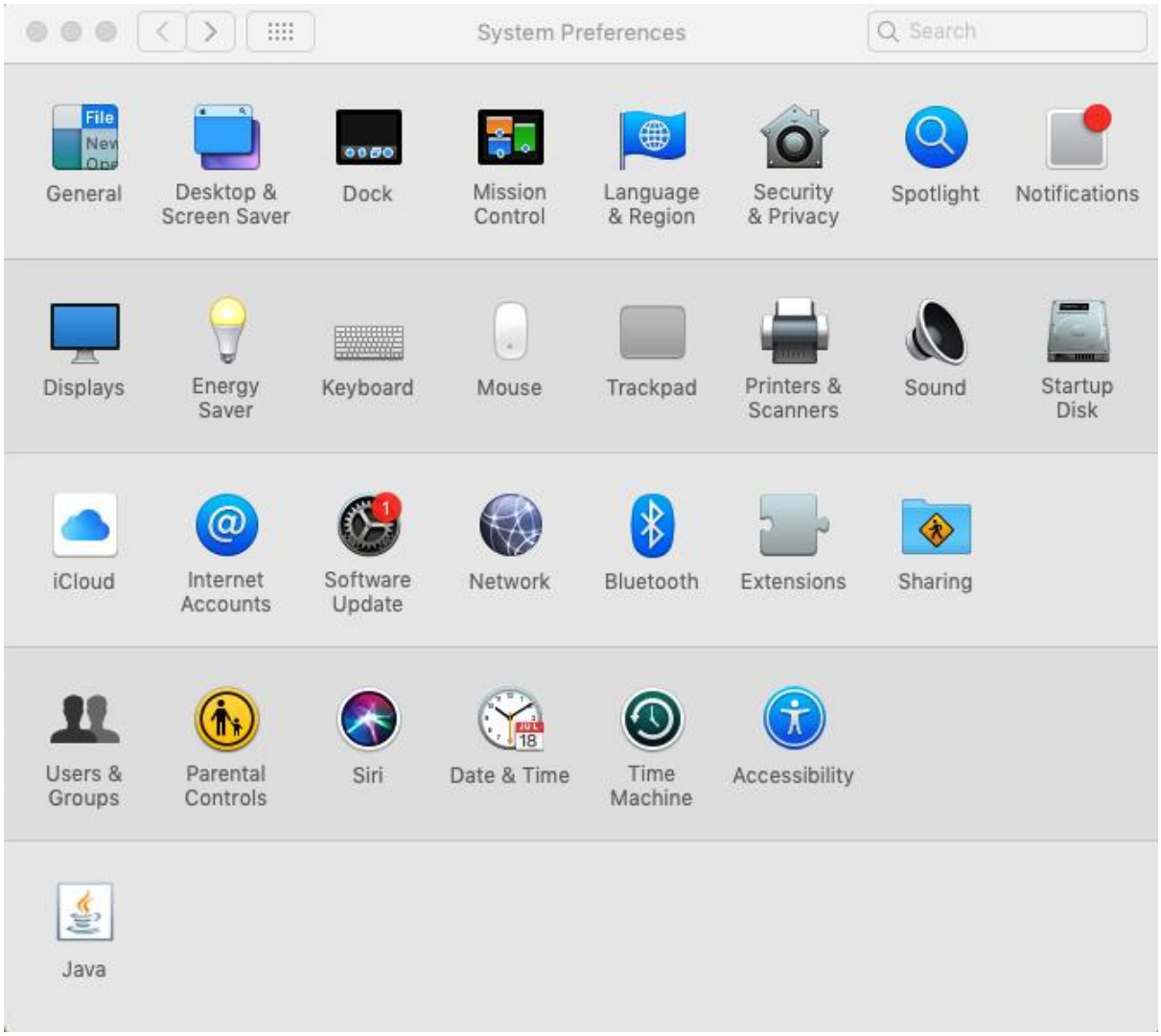
Yearly energy demand of
32.4 million
US homes

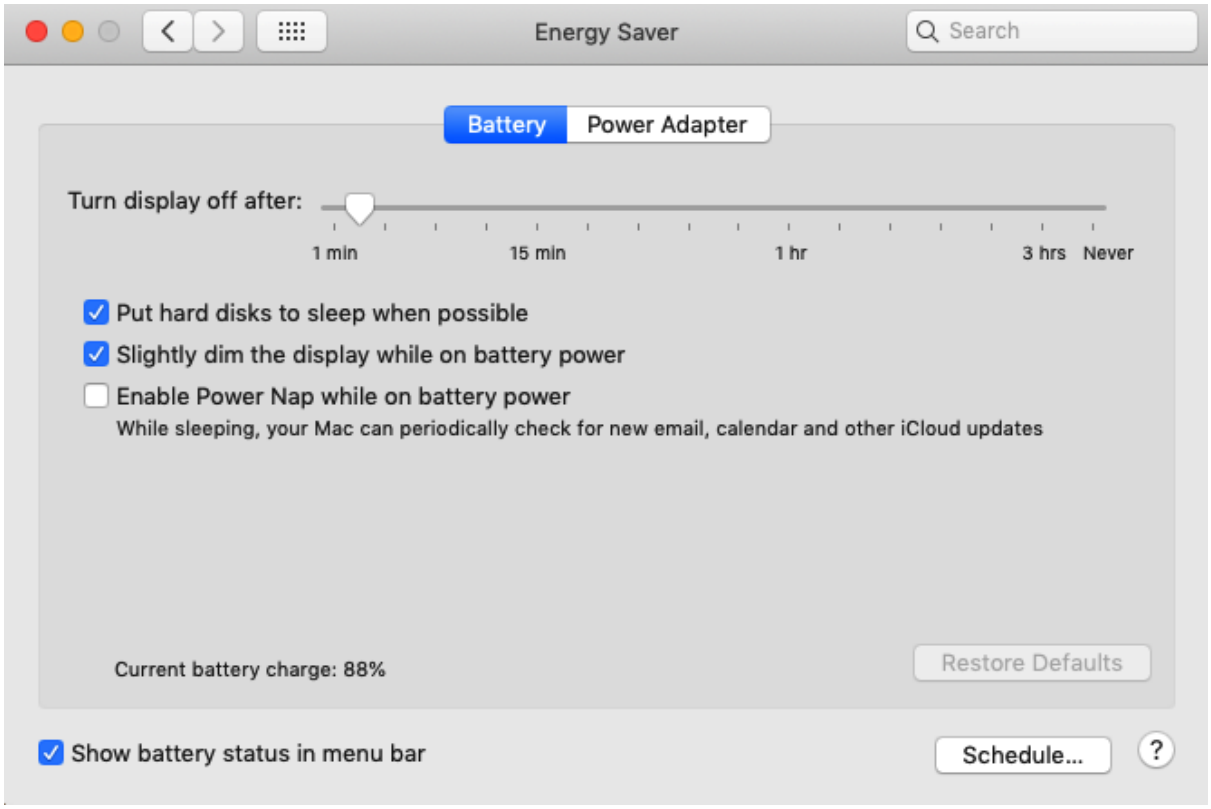
$$\frac{594\ TWh}{25{,}000\ TWh} \times 100 \approx\ 2{,}4\%$$

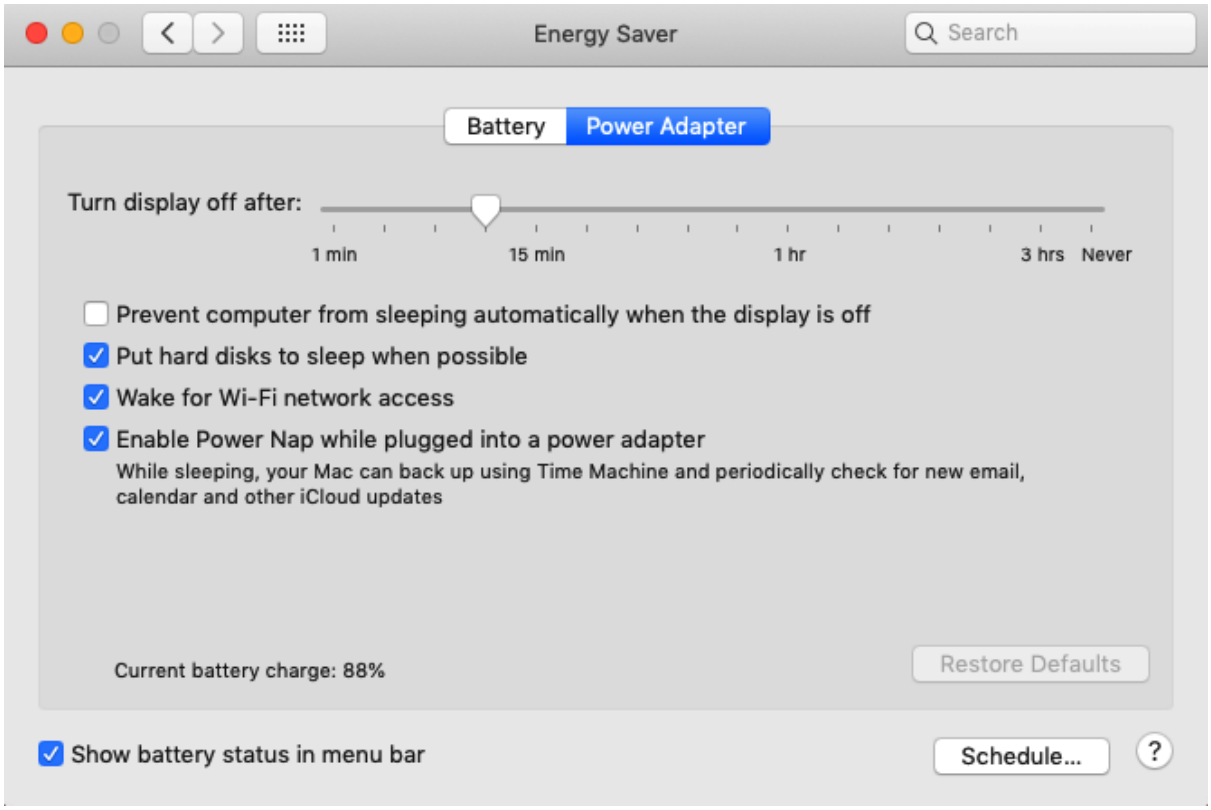



Settings
Home
Find a setting
System
Display
Sound
Notifications & actions
Focus assist
Power & sleep
Battery
Storage
Tablet
Power & sleep
Screen
On battery power, turn off after
5 minutes
When plugged in, turn off after
10 minutes
Sleep
On battery power, PC goes to sleep after
15 minutes
When plugged in, PC goes to sleep after
15 minutes


Power Options
?
Advanced settings
Select the power plan that you want to customize, and then choose settings that reflect how you want your computer to manage power.
Balanced [Active]
Desktop background settings
Sleep
Display
Battery
Restore plan defaults
OK
Cancel
Apply


System Preferences
Search
General
Desktop & Screen Saver
Dock
Mission Control
Language & Region
Security & Privacy
Spotlight
Notifications
Displays
Energy Saver
Keyboard
Mouse
Trackpad
Printers & Scanners
Sound
Startup Disk
iCloud
Internet Accounts
Software Update
Network
Bluetooth
Extensions
Sharing
Users & Groups
Parental Controls
Siri
Date & Time
Time Machine
Accessibility
Java


Energy Saver
Search
Battery
Power Adapter
Turn display off after:
1 min
15 min
1 hr
3 hrs
Never
Put hard disks to sleep when possible
Slightly dim the display while on battery power
Enable Power Nap while on battery power
While sleeping, your Mac can periodically check for new email, calendar and other iCloud updates
Current battery charge: 88%
Restore Defaults
Show battery status in menu bar
Schedule...
?


Energy Saver
Search
Battery
Power Adapter
Turn display off after:
1 min
15 min
1 hr
3 hrs
Never
Prevent computer from sleeping automatically when the display is off
Put hard disks to sleep when possible
Wake for Wi-Fi network access
Enable Power Nap while plugged into a power adapter
While sleeping, your Mac can back up using Time Machine and periodically check for new email, calendar and other iCloud updates
Current battery charge: 88%
Restore Defaults
Show battery status in menu bar
Schedule...
?

Chapter 8: Leveraging Your Buying Power

Corporate commitments
- Sustainability strategy
- Executive sponsorship
- Sustainability Business KPIs
- UN SDG[1] contributions
- ESG reporting
- Code of conduct
- Responsible travel

Environmental
- GHG[2] emissions – Scope 1,2 and 3
- Conflict minerals
- Energy usage
- Use of renewable energy
- Hazardous substances
- Water consumption
- Waste management

Social
- Human rights
- Sourcing locations
- Socially responsible manufacturing
- Working environment and conditions
- Health & safety

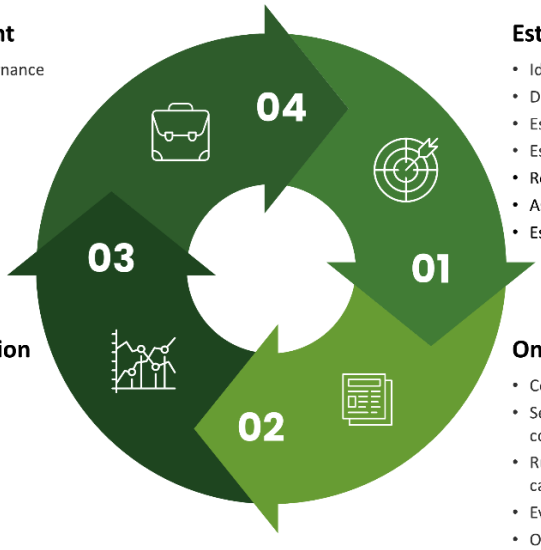
Product and Service
- Ecolabel index (Tier 1-3)
- Energy efficiency
- GHG emission product and service use
- Right-to-repair
- Product lifetime extension
- Battery charging cycles
- Warranty period

Circularity
- Circularity strategy
- Circularity design
- % of non-virgin materials
- % of parts remanufactured
- Product take-back
- Global recycling rates
- Landfill diversion rates

1) UN SDG - United Nations Sustainable Development Goals
2) GHG – Greenhouse gas emissions

Vendor lifecycle management
- Manage vendor relationships and governance
- Finance and contract management
- Connect Demand and Supply
- Vendor performance management and compliance

Establish and maintain the program
- Identify key stakeholders
- Define objectives & key results (OKR)s
- Establish organizational readiness
- Establish IT sustainability requirements
- Refine Code of Conduct with ESG criteria
- Assess, classify and optimize vendor portfolio
- Establish governance



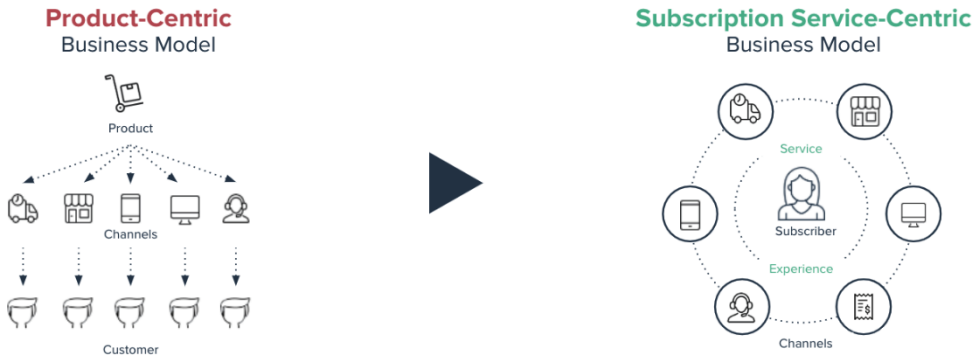
Sustainable IT value realization
- Establish relevant baseline(s)
- Develop dashboards and analytics
- Measure and follow up agreed value realization targets
- Continuous improvement

Onboard and divest vendors
- Communicate strategic intent
- Secure vendor commitment to code of conduct
- Run RFX processes as needed for selected categories
- Evaluate and select vendors
- Onboard and divest vendors

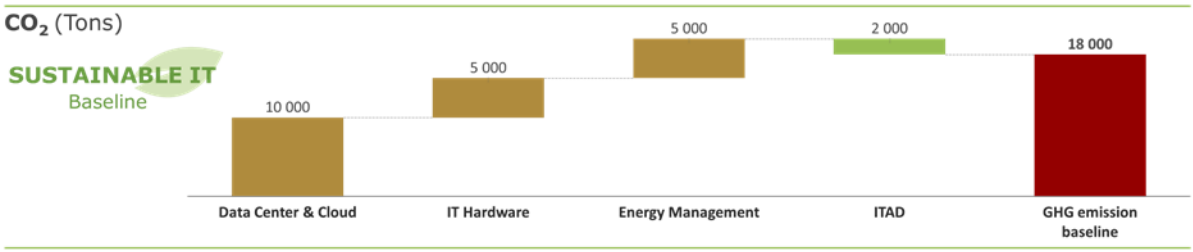
Description	Metric	General Requirement	United Nations Sustainable Development Goals Alignment
Energy Consumption	GWh mtCO2e	**CUE** Carbon Usage Effectiveness	7. Affordable and Clean Energy 13. Climate Action
Renewable Energy	%	**REF** Renewable Energy Factor	9. Industry, Innovation and Infrastructure 12. Responsible Consumption and Production
Power Usage Effectiveness	PUE	**PUE** Power Usage Effectiveness	12. Responsible Consumption and Production 13. Climate Action
Sustainable Water	WUE	**WUE** Water Usage Effectiveness	6. Clean Water and Sanitation
Waste Management	Ton %	**ERF - EDE** Energy Reuse Factor Electronics Disposal Efficiency Reduce – Reuse - Recycle	12. Responsible Consumption and Production

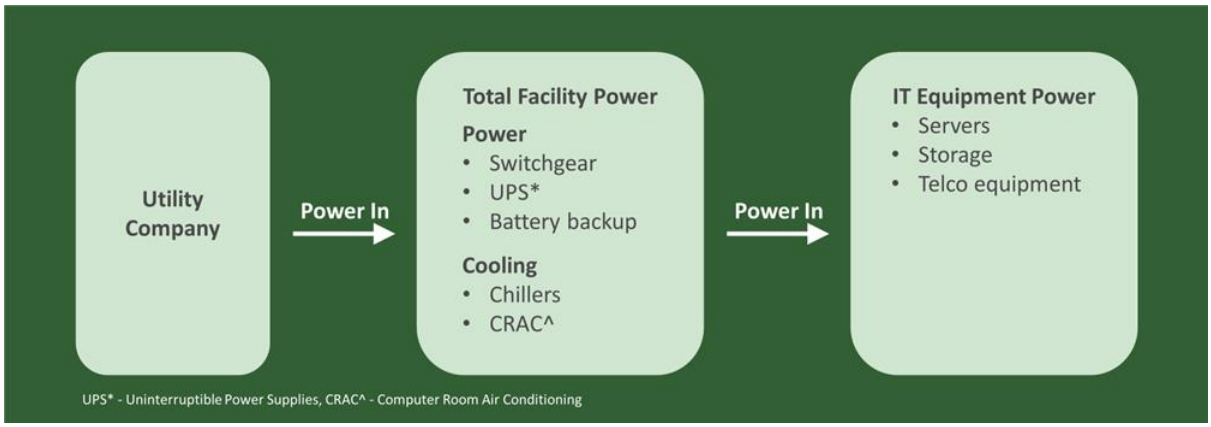
Description	Metric	General Requirement	United Nations Sustainable Development Goals Alignment
GHG Emissions	$kgCO_2$	Product Greenhouse gas emission	12. Responsible Consumption and Production 13. Climate Action
Equipment lifetime	Years	Equipment lifetime years	12. Responsible Consumption and Production 13. Climate Action
Renewable energy	%	**REF** Renewable Energy Factor	7. Affordable and clean energy 9. Industry, Innovation, and Infrastructure 12. Responsible Consumption and Production
Circular economy reuse and repair	%	**Reuse and Repair** % equipment reused	12. Responsible Consumption and Production 13. Climate Action
Zero waste to landfill	WUE	**Recycle** % equipment reused	12. Responsible Consumption and Production 13. Climate Action
Hazardous substances	%	**Hazardous Substances** % equipment with hazardous substances	12. Responsible Consumption and Production 13. Climate Action

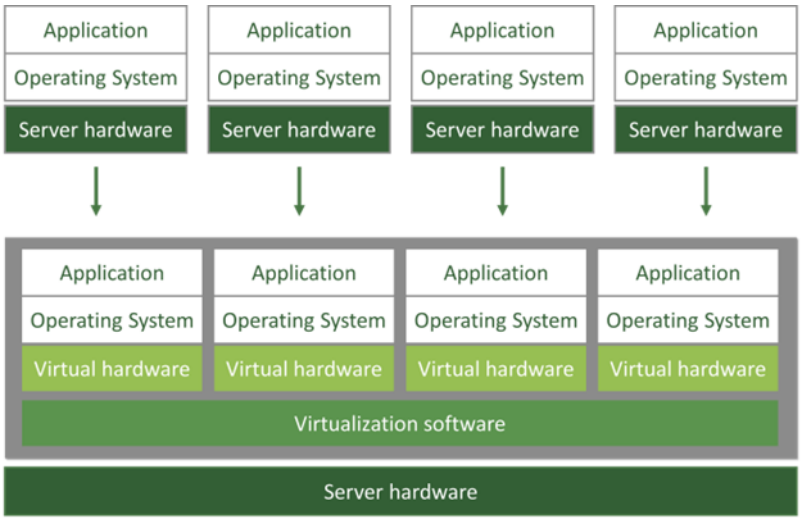
Chapter 9: Sustainability by IT

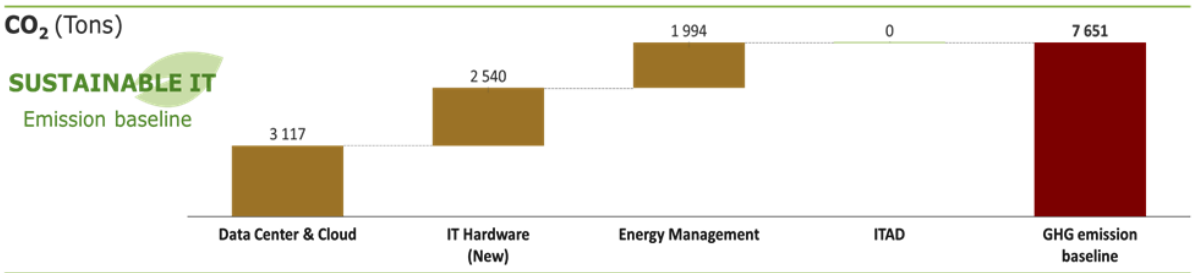


Chapter 10: Get started today

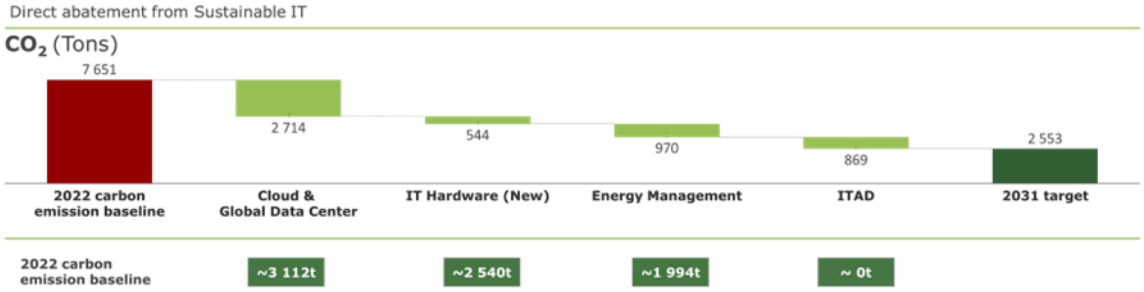






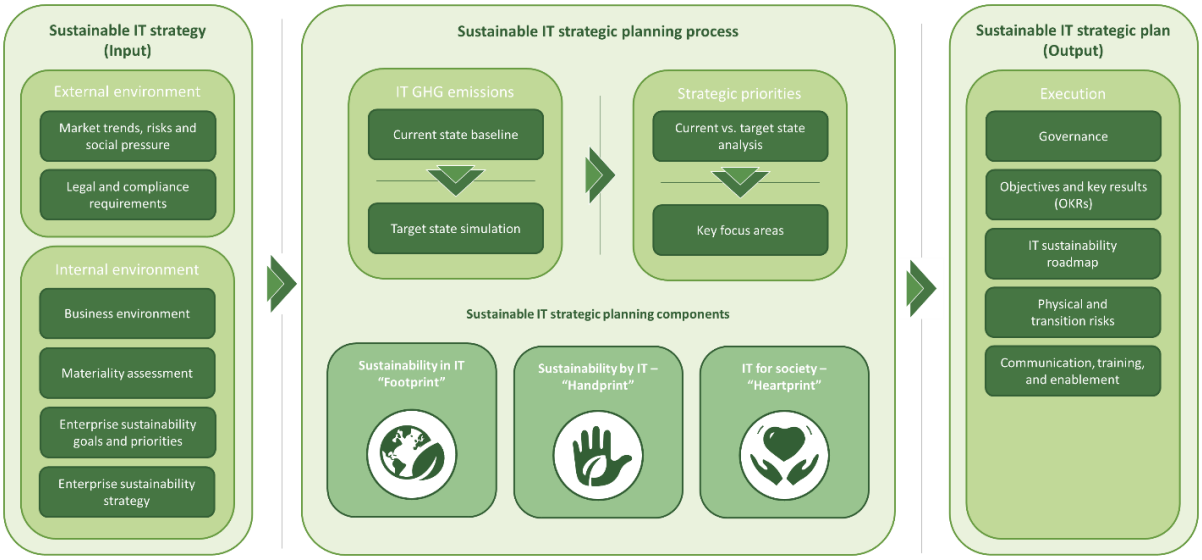


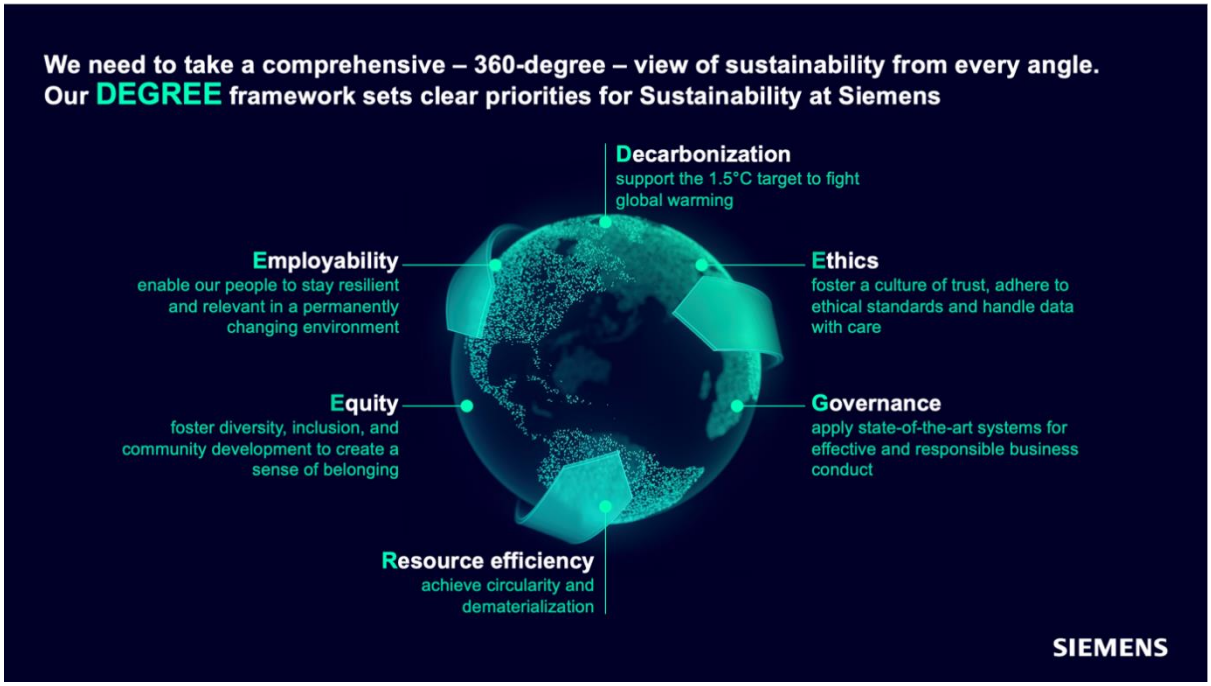
What is in our emission baseline?	1000 local server(s) 1000 global DC server(s) 1000 cloud server(s) SaaS applications not included	2500 notebooks high energy New 2000 desktops New 3750 monitors New 5000 smartphones New 1000 tablets Device-as-a-Service (DaaS) not used. Accessories (keyboards, docking station, mouse, etc) not included	Electricity to power end user IT equipment 120 location(s)	0 refurbished or recycled IT assets



2022 carbon emission baseline	**~3 112t**	**~2 540t**	**~1 994t**	**~ 0t**

Chapter 11: Putting a Sustainable IT Strategy in place





Accelerating DEGREE in IT, through IT and to society
Highlights & Achievements from Q2 FY22

Decarbonization
Employability **E**thics
Equity **G**overnance
Resource efficiency

Sustainable IT
actively driving Siemens' DEGREE framework at IT

Refurbishment
Optimization through Pickup@Home possibility (Germany & Austria) and globalization & standardization across all Siemens sites

IT Supplier Transparency
Creation of a specific IT Supplier questionnaire to receive environmental data for products & services efficient and mostly automatic

CO² Footprint in myIT / myMall
Product Carbon Footprint of IT equipment displayed and explained to raise awareness and mindset shift in device ordering

Fairphone
Sustainable smartphone in IT catalogue. Available currently in Germany & Austria, more countries soon

Public Cloud Emission Dashboard
Transparency on CO2 emissions at AWS, Microsoft and Google

IT for Sustainability
IT enables DEGREE at Siemens Enterprise

Sustainability Data Cloud
Data mesh with 84 different environmental source systems

DEGREE Reporting & Susy Tool
Enabling a standardized DEGREE reporting for Business Units, Regions and Countries

EU Taxonomy project
Joint initiative with CF R, P&O EHS and SUE to setup and implement the requirements of the EU

Sustainability@IT Community
90 ambassadors across regions, countries and businesses with monthly activities and projects

IT to Society
Corporate Social Responsibility

Equipment Donations
>2000 laptops and >1500 smartphones refurbished & donated together with Caring Hands via Covid Relief fund and currently via Ukraine support. Working hand-in-hand with other partners

#SiemensbeweatSchule
Siemens grassroot initiative, contribution with Hacker School, CodeIT. collaboration trainings for teachers

SDG4Youth
interactive presentation for schools (8th grade and higher) explaining the importance of the UN Sustainable Dev. Goals

Employee Engagement
Awareness campaigns (Earth Day, Digital Clean-up Day), 4 events in UseIT Roadshow

siaf e.V.
NGO in Munich supporting single moms with children with & w/o disabilities with IT knowledge (IT Café)

Females in Tech
Initiative of Siemens, Rossmann, Bosch, OTTO to strengthen females in technology jobs

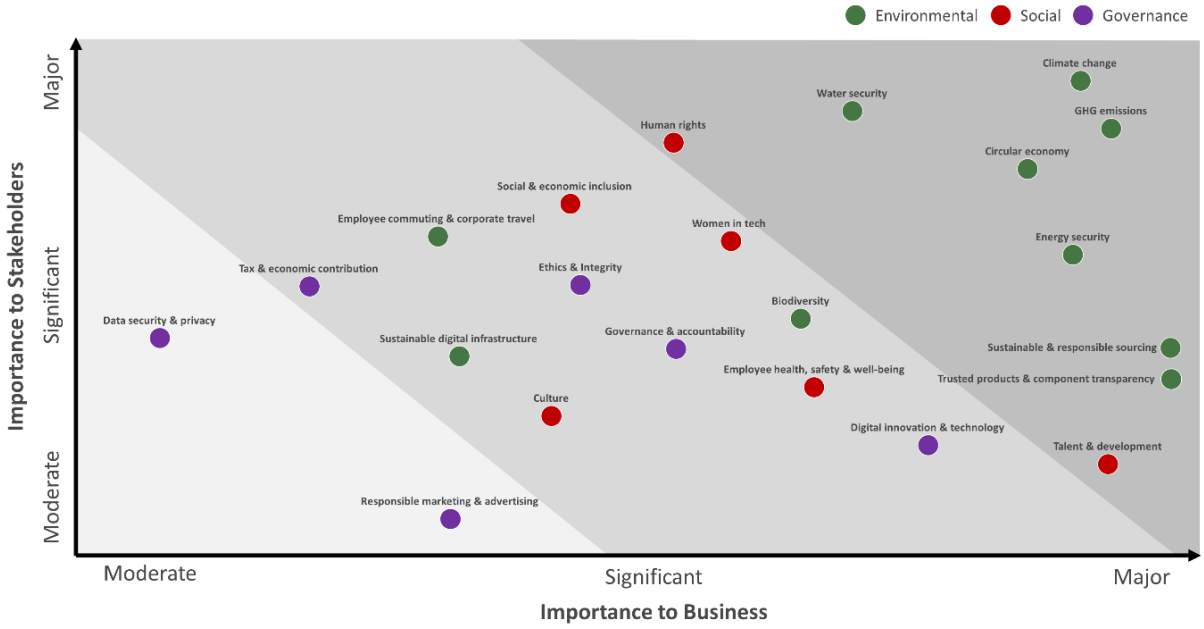
Digital Social Award
Siemens, Capgemini, Orange, AfB teamed up to award digital & social projects with impact for inclusion

Inspire & Communicate
creating an ecosystem with like-minded partners to really make an impact

Podcasts, Interviews, Videos
5 podcasts with various partners (e.g. IDC), several interviews (CIO Magazin,…), COLLAB video with Logitech & Siemens City Performance Tool

Panel Talks and Fairs
various talks on virtual & hybrid external panels (LMU, University of Bayreuth, Hasso Plattner Institute, Confare Frankfurt & Vienna, ISE Fair Barcelona, etc.)

SIEMENS



Environmental

- Climate change
- GHG emissions
- Circular economy
- Water security
- Energy security
- Sustainable & responsible sourcing
- Trusted products & component transparency
- Biodiversity
- Sustainable digital infrastructure
- Employee commuting & corporate travel

Social

- Human rights
- Talent & development
- Women in tech
- Social & economic inclusion
- Employee health, safety & well-being
- Culture

Governance

- Digital innovation & technology
- Ethics & integrity
- Governance & accountability
- Tax & economic contribution
- Data security & privacy

Climate goal

Support for 1.5°C targets to fight global warming with a focus on decarbonization

Circular goal

Shift to circular business models through resource efficiency with a focus on circularity and dematerialization

Social responsibility

Building a diverse, equitable, and diverse workplace and society underpinned by a culture of trust and high ethical standards

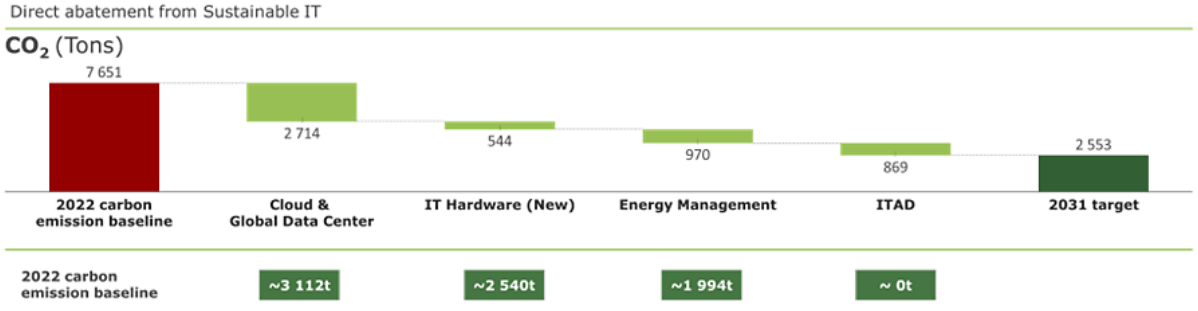
Governance

Responsible business practices in everything we do

Sustainability vision

Positive contribution to people, the planet, and profits

Strategy goals	Climate goal	Circular goal	Social responsibility	Governance
	Support for 1.5°C targets to fight global warming with a focus on decarbonization	*Shift to circular business models through resource efficiency with a focus on circularity and dematerialization*	*Building a diverse, equitable, and diverse workplace and society underpinned by a culture of trust and high ethical standards*	*Responsible business practices in everything we do*
Strategic principles	Decarbonization and biodiversity	Resource efficiency and dematerialization	People, ethics, and society	Good governance and sustainable leadership
Strategic priorities	▪ Net-zero operations by 2030 ▪ Net-zero supply chain by 2040 ▪ Contribute to the restoration of biodiversity	▪ Increased use of non-virgin materials in production ▪ 50% circularity by 2025 and >90% by 2030 through waste-to-landfill reduction ▪ Increase energy efficiency, heat recovery, and water regeneration	▪ Build resilience and adaptability in our people and society through continuous learning and assistance programs ▪ Global diverse workforce with a 40% minimum share of minorities in top management ▪ Adapt to a new normal working model ▪ Positive contribution to our communities and society at large	▪ Digital innovation & technology ▪ Secure, trusted, and transparent supply chain ▪ Reliable and trusted reporting ▪ ESG criteria tied to executive compensation



Sustainability goals and targets

Climate goals:
- Net-zero operations by 2030
- Net-zero supply chain by 2040
- Contribute to the restoration of biodiversity

Circularity:
- Increased use of non-virgin materials in production
- 50% circularity by 2025 and >90% by 2030 through waste-to-landfill reduction
- Increase energy efficiency, heat recovery, and water regeneration

Social responsibility:
- Build resilience and adaptability in our people and society through continuous learning and assistance programs
- Global diverse workforce with a 40% minimum female share in top management
- Adapt to a new normal working model
- Positive contribution to our communities and society at large

Governance:
- Digital innovation & technology
- Secure, trusted, and transparent supply chain
- Reliable and trusted reporting
- ESG criteria tied to executive compensation

Challenges and pain points

Sustainability in IT – "Footprint"
- A large share of servers in high-carbon cloud and data centers
- No sustainability is embedded into application portfolio management or software development
- Limited energy management visibility and tracking
- A high turnover rate of IT hardware, limited repair, and reuse
- Limited sustainability requirements embedded within RF(X), contracts, etc.

Sustainability by IT – "Handprint"
- Visibility of current emission baseline
- Lifecycle assessment (LCA) of current product and service portfolio
- New regional and national regulatory requirements
- Limited sustainability innovation in products & services

IT for society – "Heartprint"
- 15% of minorities share in top management
- Scarcity of trained sustainability professionals
- Limited sustainability training available

Capabilities and required step-change

Sustainability in IT – "Footprint"
- Cloud & Data Center
- Application portfolio management
- Sustainable software development
- Efficient resource management
- Circular IT hardware management
- IT Asset disposition
- Vendor management and IT procurement

Sustainability by IT – "Handprint"
- GHG emission visibility & reporting
- Digital innovation & technology
- Product as a service
- Sustainable supply chain incl. product and services LCA visibility
- Energy-efficient buildings
- Hybrid-work

IT for society – "Heartprint"
- Organizational enablement
- Social responsibility programs
- Women in tech
- Sustainability hackathons

Objectives and key results

Sustainability in IT – "Footprint"
- Reduce a minimum of 70% CO2 emission from IT operations, including scope 3 by 2030
- Reduce CO2 emission from Cloud & Data Center operations by 70% or more by 2050
- Prolong lifespan of IT hardware
- Increase share of Device-as-a-Service (DaaS)
- Improve energy resource efficiency by 50%
- Remove one ton CO2 emission through ITAD per year by 2030

Sustainability by IT – "Handprint"
- Enable sustainable digital innovation & technology
- Provide support for single source of truth for environmental data across the enterprise
- Support for supplier and scope 3 management

IT for society – "Heartprint"
- Awareness campaigns and formal training
- Initiate IT hardware and employee time donation programs
- Increase the share of women in IT roles by 30%

Sustainable IT Strategy

WHY
- Support for 1.5°C targets to fight global warming
- Shift to circular business models through resource efficiency with a focus on circularity and dematerialization
- Building a diverse, equitable, and inclusive workplace and society underpinned by a culture of trust and high ethical standards
- Responsible business practices in everything we do

WHAT
We aim to reduce our carbon "footprint" and "handprint" generated by our digital infrastructure while increasing our "heartprint" by building resilience and adaptability in our people and society.
Our sustainable IT strategy is decomposed into three workstreams: sustainability in IT, sustainability by IT, and IT for society.

HOW

Sustainability in IT

Short term (6-12 months)

Data center and cloud:
- Assess servers running in high-carbon intensity regions
- Start migrating servers to low-carbon intensity cloud or PUE efficient data centers regions

Application Portfolio Management:
- Conduct APM assessment

Sustainable Software Development:
- Introduce guidelines and frameworks
- Start measuring carbon intensity on a subset of applications

Circular IT hardware:
- Assess the environmental impact on existing IT assets
- Prolong IT hardware life cycle on key IT asset classes (computers, smartphones, etc)
- Initiate IT asset disposition (ITAD)

Efficient energy management:
- Start measuring and monitoring energy on IT assets
- Take action on high-impact areas

Vendor mgt. and IT procurement
- Make your sustainability intent known to your vendor
- Create IT vendor questionnaire to start collecting environmental and social data for products and services
- Develop IT sustainability requirements

Mid term (12-36 months)

Data center and cloud:
- Complete migration of servers
- Explore AI & ML to optimize energy efficiency and resource utilization
- Leverage heat recovery techniques

Application Portfolio Management:
- Initiate application rationalization process

Sustainable Software Development:
- Start measuring carbon intensity on a subset of applications
- Rearchitect energy inefficient and resource intense applications

Circular IT hardware:
- Global rollout and industrialization ITAD
- Explore green leasing
- Introduce eco-friendly, modular, and energy-efficient IT hardware

Efficient energy management:
- Rollout global policies on energy management
- Explore carbon-aware patching and updates for a subset of IT asset categories

Vendor mgt. and IT procurement:
- Automate collection of IT vendor environmental and social data
- Assess IT vendor sustainability performance - Introduce new vendors and divest as needed
- Include IT sustainability requirements in major RFXs

Long term (36 months -)

Data center and cloud:
- Explore emerging data center and cloud technologies

Application Portfolio Management:
- Finalize application rationalization
- Reassess application portfolio (as needed)

Sustainable Software Development:
- Measure carbon intensity on all applications with frequent changes
- Continuously improve sustainable software development practices

Circular IT hardware:
- Continuously improve circular IT hardware management practices

Efficient energy management:
- Continuously remove and replace energy-efficient IT hardware as they become end-of-use
- Carbon-aware patching and updates for all IT assets

Vendor mgt. and IT procurement:
- Include IT sustainability requirements in all RFXs
- Continuously upgrade IT sustainability requirements

Sustainability by IT

Short term (6-12 months)

GHG emission visibility & reporting:
- Data acquisition for Scope 1 and Scope 2
- Establish initial Scope 1 and Scope 2 GHG emission baseline
- Identify Scope 3 sources

Digital innovation and technology:
- Explore exponential technologies to develop new products and services

Product as a service:
- Business model innovation - Explore different alternatives to transform your products into services

Sustainable supply-chain:
- Conduct a life cycle assessment (LCA) of your existing and future product and service portfolio
- Identify key areas to reduce environmental impact

Energy-efficient buildings:
- Start measuring and monitoring energy efficiency from offices, manufacturing plants or logistics centers
- Take action on high-impact areas (i.e. transition to low-carbon steel, marine freight over airline freight)

Hybrid-work:
- Implement a hybrid-work HR policy
- Upgrade your productivity, collaboration, and security suites to support working anytime from anywhere

Mid term (12-36 months)

GHG emission visibility & reporting:
- Establish complete measurement across Scope 1-3
- Automate data acquisition from both internal and external data sources
- Report to governance bodies as needed

Digital innovation and technology:
- Solution design and prototype development
- Limited deployment of new products and solutions in the marketplace

Product as a service:
- Test commercial viability of product as a service offering
- Roll out a few test offerings in a specific market or customer segment/base. Do not be afraid to kill your darlings

Sustainable supply-chain:
- Redesign supply-chain delivery network to reduce environmental impact
- Implement or upgrade environmental product declaration to include LCA

Energy-efficient buildings:
- Install Internet-of-Things (IoT) devices to improve energy efficiency in your locations

Hybrid-work:
- Redesign talent acquisition process
- Explore new technologies to improve hybrid-work

Long term (36 months -)

GHG emission visibility & reporting:
- Industrialize GHG emission visibility and reporting

Digital innovation and technology:
- Deployment of commercial products and services in the marketplace

Product as a service:
- Deployment and rollout of commercial offerings at scale

Sustainable supply-chain:
- Implement redesign of supply-chain delivery network

Energy-efficient buildings:
- Explore AI/ML to automate building energy efficiency

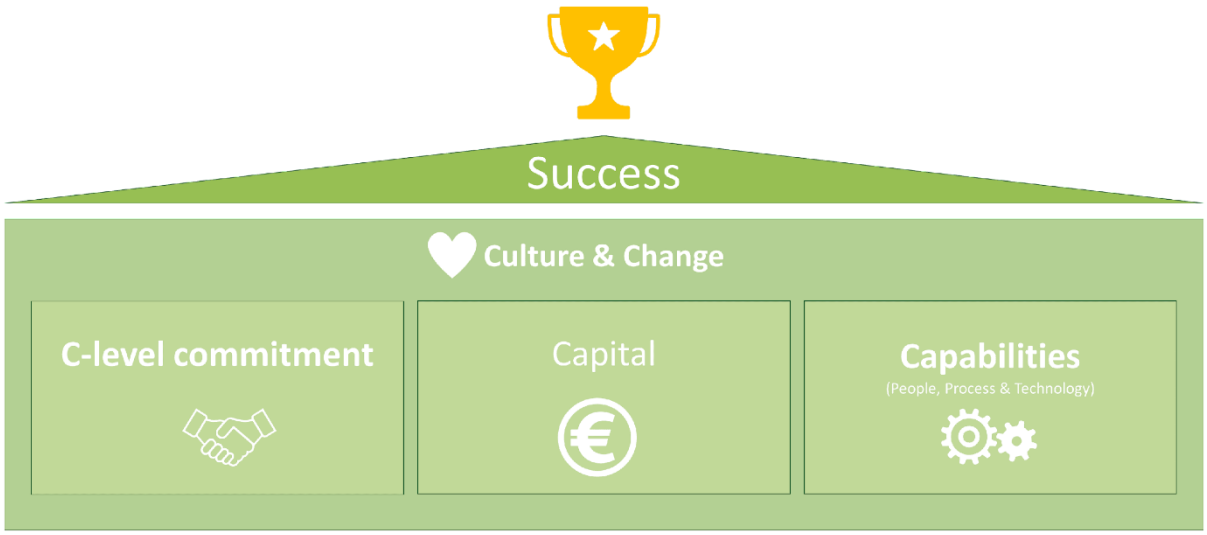
Hybrid-work:
- Explore different ways to preserve and build a culture in a hybrid-working mode
- Continuously reassess and improve hybrid work as needed

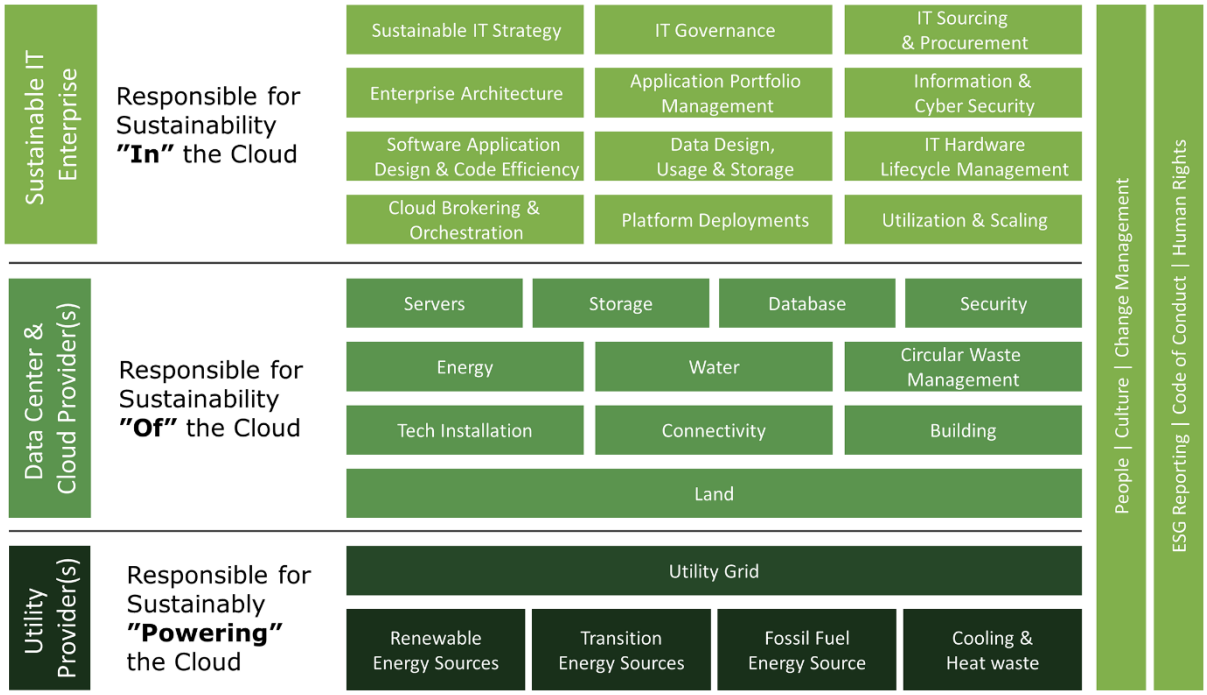
IT for society

Short term (6-12 months)	Mid term (12-36 months)	Long term (36 months -)
Organizational enablement: • Communicate sustainable IT strategy • Develop awareness campaigns and general and specific sustainability training • Make it easy for employees to get involved **Social responsibility programs:** • Establish IT asset donation program • Establish social outreach program(s) **Minorities in tech:** • Assess existing male/female ratio across IT organization • If gender targets do not exist, set targets • Develop a Minorities in Tech (MIT) strategy to reach targets • Design a 2–3-years MIT trainee program **Sustainability hackathons:** • Dream - Co-create innovative ideas as input to hackathon event	**Organizational enablement:** • Run continuous awareness campaigns • Roll out training to the target audience • Develop employee engagement through earth day, digital clean-up day, etc • Make it easy for employees to make sustainable choices **Social responsibility programs:** • Encourage employee engagement in social responsibility programs • Employee time donation program • Sustainability for youth program **Minorities in tech (MIT):** • Execute on MIT strategy • Implement the first MIT trainee program **Sustainability hackathons:** • Hack - Hackathon to hack solutions to identified challenges and dreams	**Organizational enablement:** • Measure and monitor employee engagement and adjust as needed • Continuously run awareness campaigns and **Social responsibility programs:** • Continuously assess and reposition social responsibility programs as needed **Minorities in tech:** • Follow-up and adjust MIT strategy as needed • Industrialize the MIT program and run a new class bi-annually or annually **Sustainability hackathons:** • Build – Build and scale solutions for a sustainable future

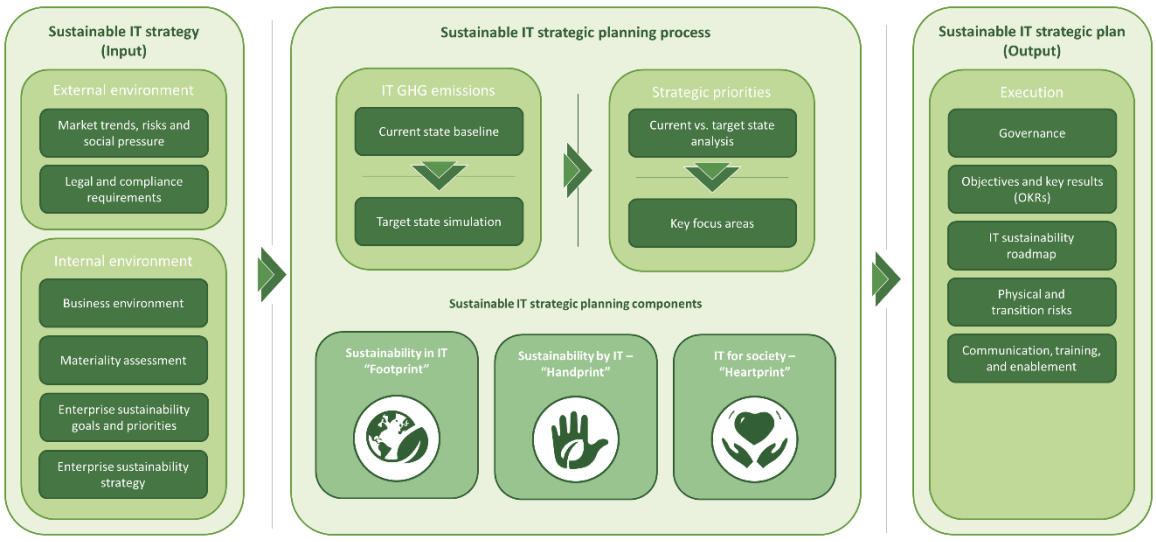
Expected results	
A flexible technology platform to support the company's future growth running on low-carbon intensity	
Objectives	**Activities**
■ Migrate existing server estate to a modern cloud computing platform ■ Cloud computing enables IT systems to be scalable and elastic. ■ Increase share of the virtualization ■ Improve security and compliance ■ Retire old legacy technology platforms	■ Identify all infrastructure in scope to be migrated ■ Conduct analysis on viable migration options, limitations, risk, dependencies ■ Create a migration plan ■ Plan out-migration steps in detail ■ Prepare a communication plan and communicate continuously with stakeholders ■ Prepare a final cut-over plan ■ Conduct migration(s) ■ Verify migration results
Interdependencies/Risks	**Benefit**
■ Lack of cloud engineers ■ Migration of legacy systems	■ Provide a customer experience that is always on with no downtime and no service windows ■ Deliver IT services (software, platform, and infrastructure) to realize agility, scalability, reliability, resilience, cost optimization, and sustainability benefits. ■ Decarbonize our digital infrastructure with a minimum of a factor of 20x
Initiative Manager	**Sponsor**
Digital infrastructure transformation manager	Chief Information Officer

Chapter 12: From Strategy to Execution – Lead with Purpose and Deliver Progress Quickly





	Initial	Unstructured	Defined	Managed	Optimized
Commitment	• Not on the IT agenda • No targets defined	• Seen as an area of influence & risk mitigation • No clear Objectives and key results defined and agreed	• Seen as an enabler • Clear objectives and key results defined and agreed	• Seen as a key enabler • Embedded as part of the overall IT delivery • Connected to overall sustainability agenda	• Seen as a competitive advantage • Fully embedded as part of the overall IT delivery
Governance	• No governance or reporting structure exists	• No current baseline or target state defined • Limited governance structure exists	• Current baseline and target state defined, agreed & tracked • Governance structure defined and operational	• Current baseline and target state defined, agreed and tracked in a consistent way. • Governance structure well managed	• Gap closed between initial and target state baseline and new ambitions targets established
Processes & Tools	• No processes defined • No tool support	• Ad hoc processes • Limited or no tool support	• Defined processes • Tool support fully operational	• Managed processes • Mature and managed tools support	• Focus on continuous improvement of processes & tools
People & Organization	• No executive support • Lack of awareness of understanding • No resources appointed	• Limited executive support • Awareness and understanding maturing • Single or few resources appointed	• Executive support exists • Resources appointed and organization defined • Mature wide organizational awareness and understanding	• Strong Executive support • Well managed organization • Sustainability becoming embedded as part of the fabric of the organization	• Fully engaged Executive support • Sustainability fully embedded as part of the fabric of the organization
Performance Management	• No metrics defined	• No consistent metrics defined and applied • Ad-hoc reporting	• Consistent metrics defined, and agreed • Manual reporting	• Mature metrics • Automated reporting	• Metrics continuously being modified and refined
	Level 1	Level 2	Level 3	Level 4	Level 5



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- Shift to circular business models through resource efficiency with a focus on circularity and dematerialization
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- Responsible business practices in everything we do

WHAT

Sustainable IT

Strategy

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