WEBINAR

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Digital IT going green !

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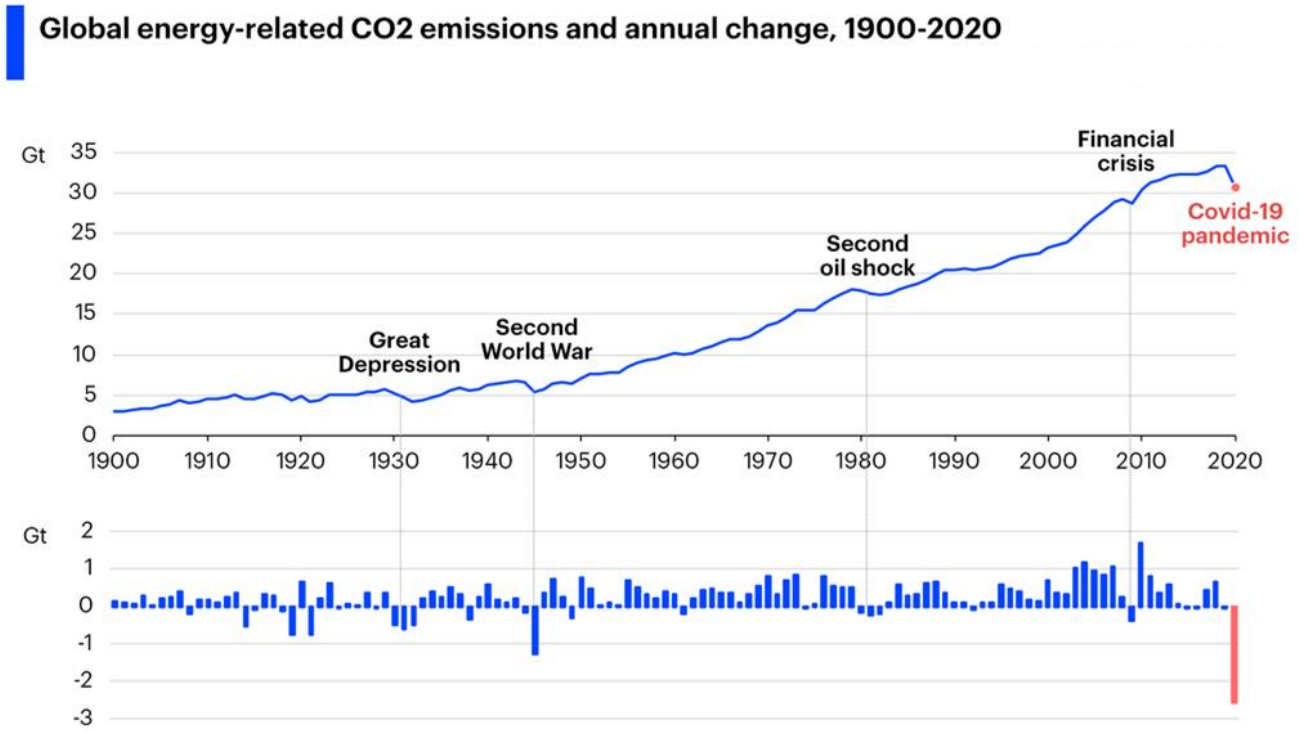
Digital IT going GREEN!

Some context

Context - Climate Crisis.



International Energy Agency

Context - Carbon footprint.

Your flight from SIN to PAR

Distance

A → B 21465 km

Your Emissions

CO2 3.22 tonnes of CO2 - per person

3.22 tonnes of CO2 equals about

4594 laundry washes

1576 showers of 10 minutes

1675 days watching TV

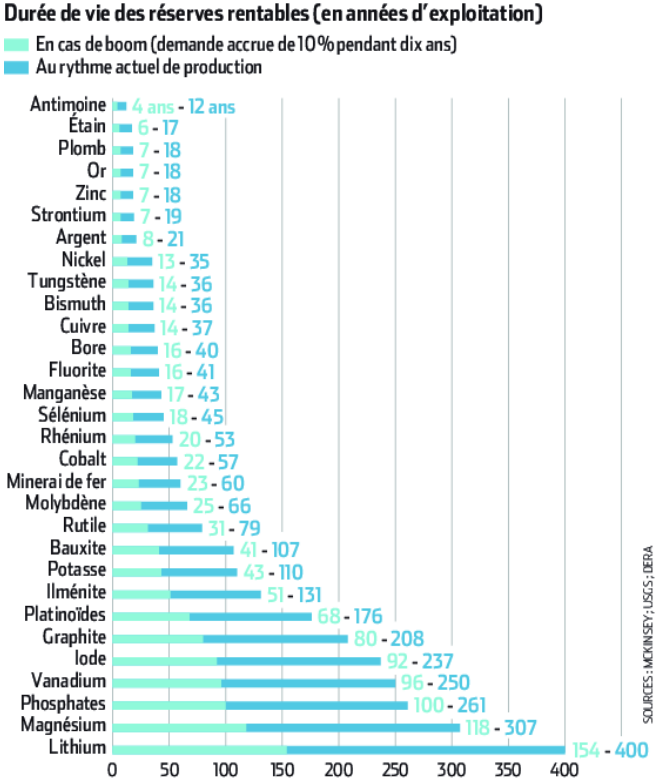
Manufacturing 130 jeans

Manufacturing 10 laptops

Manufacturing 40 smartphones

Sources : GreenIT.fr, The Shift Project, ADEME / **https://flygrn.com/**

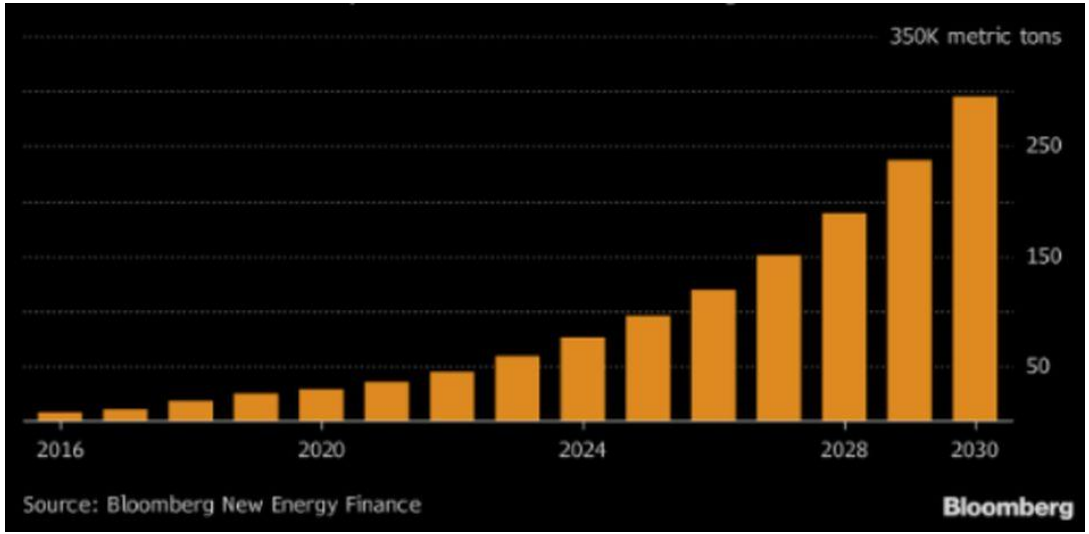
Context - Natural resources depletion.



La guerre des métaux rares, Guillaume Pitron
France Stratégie - La consommation de métaux du numérique
« L'épuisement des métaux : faut-il s'inquiéter ? » (ADEME)

Context

Context - Resources Rarity: Copper.



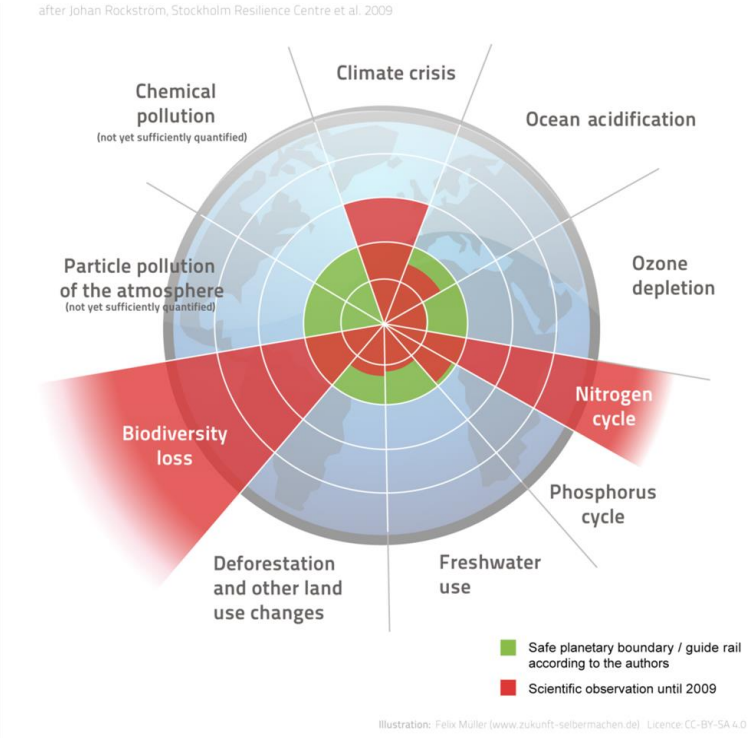
During the 30’s, we needed to mine and process **55**t of mineral resources to produce 1t of copper.

We need **125** today.

e-manufacturing has economical, social and geopolitical impacts.

Rare earth metals: tech manufacturing.

Context - The Rebound Effect.



- Traffic keeps increasing, so does data transfer
- User devices manufacturing is likely to increase a lot:
  - with IoT trends
  - with mobile devices FOMO marketing
- People habits tend to push the usage boundaries

Context

[Planetary Boundaries]

Sustainable Development.

3 Ps

- to meet the present needs
- to secure the future needs

PLANET

Preserve the ecosystem, biodiversity, fauna and flora

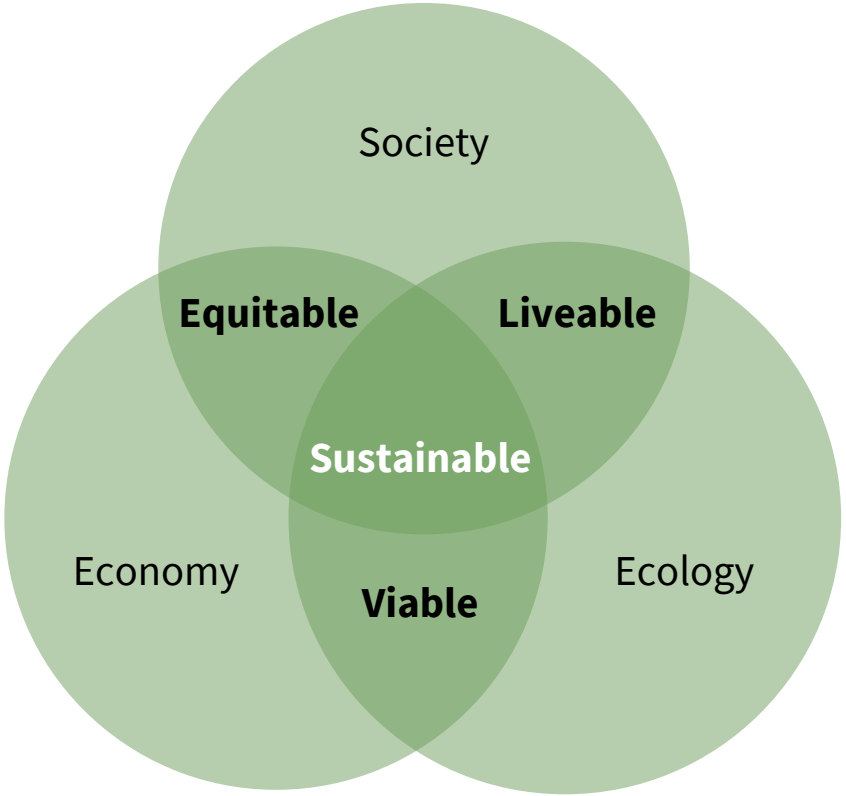
PEOPLE

Address the people's needs, safety and diversity

PROFIT

Design sustainable production and consumption patterns

Sustainable Development.



Definitions.

GreenIT

Continuous improvement approach

Control the environmental, social and economic footprint of IT

IT for Green / Green IT 2.0

Use IT solutions to reduce the environmental impact of other industries

Sustainable Digital

Digital sustainability is the means by which digitalisation, as a key part of the fourth industrial revolution, can deliver on the global **sustainability** goals

Eco-Design

Product engineering following the principles of sustainable development

Digital Sobriety

Mindful and responsible usage of IT
(eg. low tech)

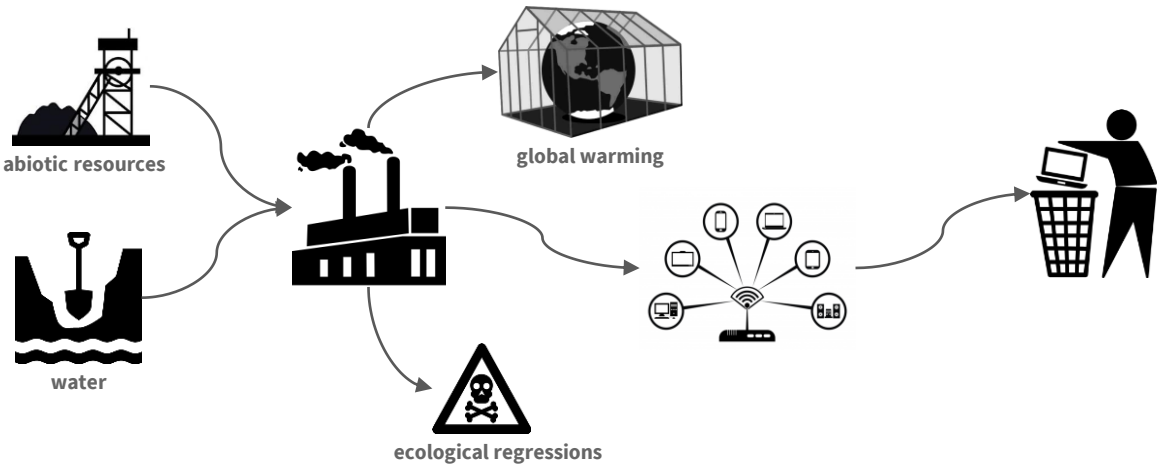
Green IT 1.5

Target to **reduce** the impact of the company's organisation (eg. transport, infrastucture)

Definition

Life-cycle Assessment (LCA).

Normalised methodology to assess environmental impacts associated with all the stages of the life cycle of a commercial product, process, or service (ISO 14040 et 14044)



Pentium 4 - LCA.

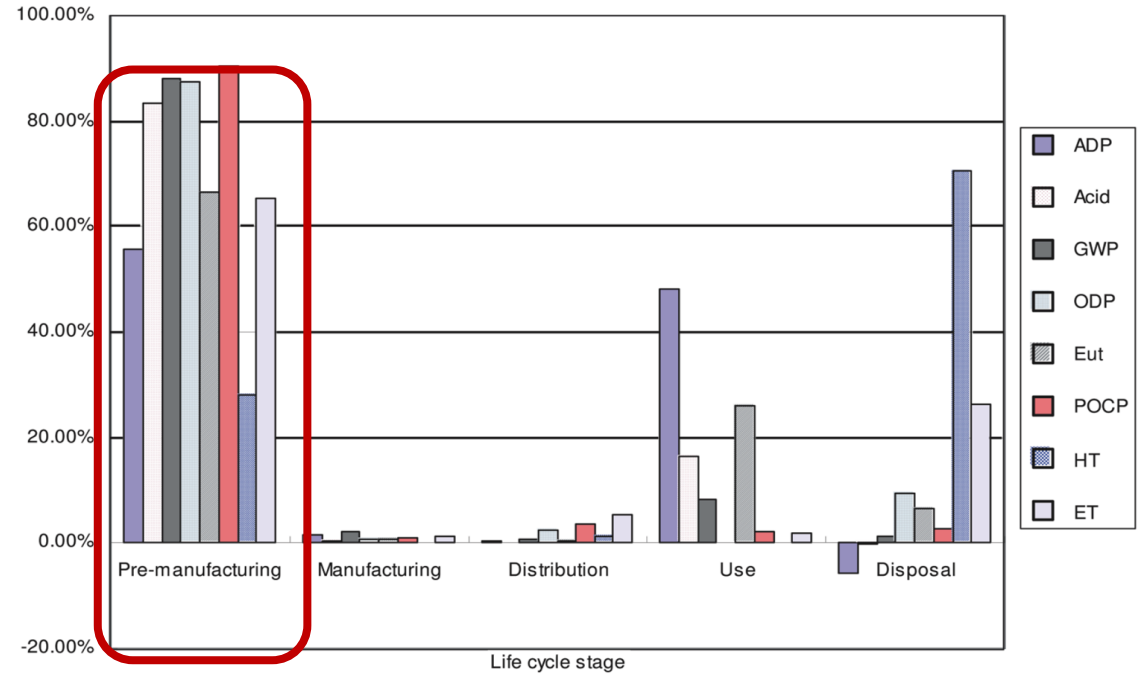


Fig. 2: Environmental impact assessment result for a personal computer

ADP: Abiotic Depletion Potential – non-renewable resources

Acid: Acidification (water, soil)

GWP: Global Warming Potential

ODP: Ozone Depletion Potential

Eut: Eutrophisation

POPCP: Photochemical Ozone Creation Potential

HT: Human Toxicity

ET: Ecosystem Toxicity

Source : LCA of a PC and effective recycling rate, Choi et al, 2006

Why?

Digital Impact - Breakdown.

%	Energy	GHG	Water	Elec.	ADP
User equipment	60%	63%	83%	44%	75%
Network	23%	22%	9%	32%	16%
Data centres	17%	15%	7%	24%	8%

Breakdown of impact of the digital world in 2019

GreenIT.fr empreinte environnementale du numérique mondial

Obsolescence.

MATERIAL

New device not always compatible with old techno

Device lifespan reduce a lot

SOFTWARE

Le Low-tech and retro compatibility most of the time put a side

Logiciel obesity are the new standard

MARKETING

Follow trend

Add functionalities and products

Eco-Design?

“The priority is to reduce our power consumption.”

It depends.

“You cannot measure the impact of a software. It’s intangible.”

We measure it on the underlying hardware.

“Data centers have the biggest environmental footprint.”

Not anymore.

“Green IT is just a defensive approach.”

Partially.

Eco-designing - Green IT 2.0.

Positive impact on industry sustainability

A well-designed IT product (software + hardware) can **optimize**:

- **Energy consumption** & **Equipment durability**
- **Cost** & **Performance** (soft + equipment)
- **Branding** (with limited impact - HBR 2019: 66% willing, 26% acting)

It can improve **social inclusion** by focusing on **accessibility and availability of services for:**

- Persons **with handicaps**
- Persons without proper training (**digital illiteracy**)
- Populations with **limited access to internet**

3 options to get started.

Option 1.

LCA-based approach

Eco-Design - Analysis first.

For a simplified assessment:

- **GWP** (Global Warming Potential): mainly greenhouse gases (GHG).
- **ADP** (Abiotic Depletion Potential): cannot be replenished on a human time scale
- **PED** (Primary Energy Depletion): oil, coal, uranium, etc...
- **WD** (Water Depletion): blue or green water consumption

(Power consumption is not a relevant indicator here)

LCAs are interesting when compared to other LCAs.

State of the Art.

01. **Identify the audited elements** (CIO, data center, software business unit…)

02. Carry out an **LCA** - compare with existing profiles
Identify **areas of progress** and **sources of impact**

03. Define an **action plan aligned with business objectives**

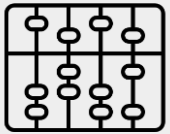
04. **Support the transformation** initiated by the action plan
Involve stakeholders (e.g. employees, developers and business...)

05. **Define KPIs** monitored by a Steering Team
Keep the progress **always visible to decision-makers**

Analytics complexity - Pitfalls.

RAW DATA

Maintenance is **expensive**
Consolidation is **complex**.



CALCULATION

The **impact** must be calculated for each audited element.

COMPARISON

The comparison is interesting **only if the results can be compared** with similar "profiles".

Start small with a critical modules and/or features.

How?

Option 2.

Craft approach

Eco-Design - Crafting first.

Set impactful **Objectives**

- **DIVIDE BY ??** the number of required servers over the next 5 years
- **DIVIDE BY ??%** the amount of transmitted data over the next 5 years
- **AUGMENT BY ??%** the lifespan of user equipments over the next 5 years

Build your own **Referential** of shared Green practices

- **Using ??** in that context reduces CPU/RAM usage by ?? contributing to ??
- **Designing ??** reduces device usage by ?? contributing to ??
- **Optimizing ??** reduces network usage by ?? contributing to ??

Eco-Design - Foundations.

- **Infrastructure Architecture** considerations (softwares are not tangible)
- **Software Craftsmanship** best practices application
- **Low-tech** as a default choice - high-tech only when necessary
- **Accessible UI/UX design**, architectural decisions and tooling choices
- New **ROI** for each phase of a Software Development Life Cycle (SDLC)
  - **R**ecycle - reuse as is, reuse partly or transform
  - **O**ptimize - design for efficiency
  - **I**nnovate - think out of the digital box

Eco-Design - Craftsmanship.

Focus areas

Eco-design can be considered during each product lifecycle phase:

- ***Requirements gathering***
- ***UI / UX design***
- ***Architecture decisions***
- ***Technology choices***
- Development
- Build and integration
- Tests
- Usage in production
- Monitoring

KAIZEN

Most impactful decisions are taken during the inception phase.

Option 3.

Trial approach

Eco-Design - Trial first.

Start from **existing referentials**:

- Numérique Responsable - 65 key best practices
- GreenIT.fr - 115 best practices for the web
- Opquast (Open Quality Standards) - best practices

Apply and log outcomes:

- **Using ??** in our context produced a positive effect
- **Using ??** in our context did not change anything
- **Using ??** in our context was not possible

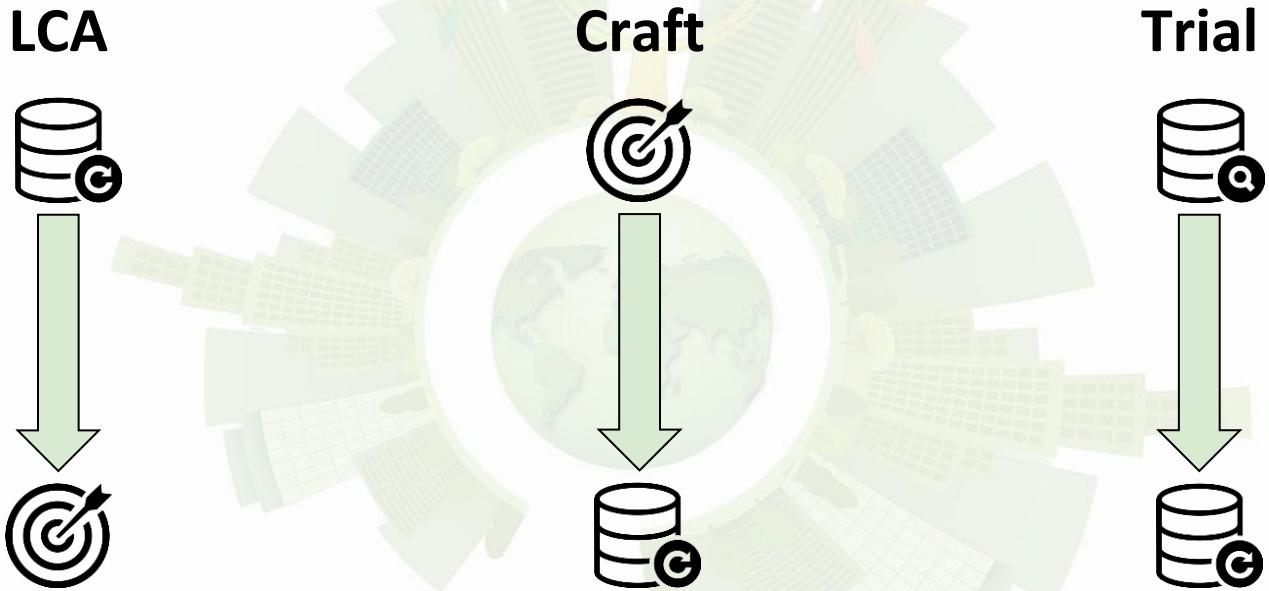
Downside of external referentials.

- Each IT context has their own set of specificities / priorities
  - *applying recipes will only get you so far*

- Most referentials address **web applications** or **general IT assets administration**, with a strong focus on network and client devices usage
  - *data lakes, service meshes, ML, distributed computing… are topics that are less covered*

But applying recipes is still relevant as a starting point.

3 options to get started.



Thank you.

Some references.

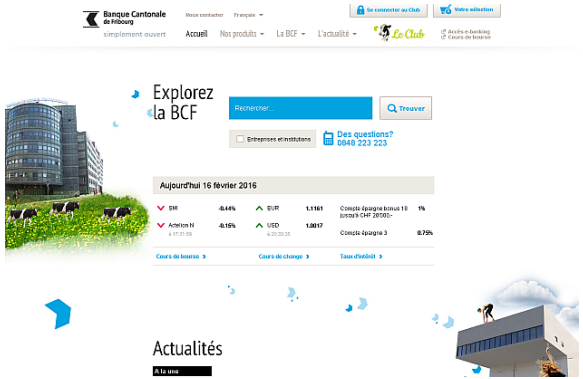
Insights and ideas

- The Shift Project: https://theshiftproject.org/en/home/
- Greenspector blog: https://greenspector.com/en/blog-2/
- GreenIT.fr (mostly in French): https://www.greenit.fr/
- Study: The environmental footprint of the digital world: https://www.greenit.fr/wp-content/uploads/2019/11/GREENIT_EENM_etude_EN_accessible.pdf
- Cloud Providers comparisons: https://www.wired.com/story/amazon-google-microsoft-green-clouds-and-hyperscale-data-centers/

- Referentials:
  - https://institutnr.org/wp-content/uploads/2020/06/2020-v3-65-bonnes-pratiques-greenit.pdf (FR)
  - https://collectif.greenit.fr/ecoconception-web/2019-05-Ref-eco_web-checklist.v3.EN.pdf (EN)
  - https://res.cloudinary.com/opquast/image/upload/checklists/OPQUAST-GREENIT-BEST-PRACTICES_V1_FR.pdf (FR)

Eco-design example: Banque cantonale de Fribourg.

Banque Cantonale de Fribourg (2011)



Good practices

- Production of 104 good practices for teams
- First input for the 115 best practices from GreenIT.fr

Optimisations

- CSS rather than images
- Images Compression (bmp => jpg)
- Animations removal
  - Snowflakes were using 80% of the CPU!

Indicators	Before	After	Reduction ratio
Page loading time	24 sec	3 sec	8
# of HTTP Requests	117	23	6
Page size	5,8 Mo	0,3 Mo	19