

Reducing ICT environmental impacts :

Where to focus on in priority?

PERCCOM
erasmus mundus



green IT .fr

Frédéric Bordage
Green IT & software ecodesign expert
info @ greenit.fr



Alliance Green IT (AGIT)
www.alliance-greenit.org

DNA

- Consulting
- Green IT, software eco-design, IT for Green
- Best experts network in Europe

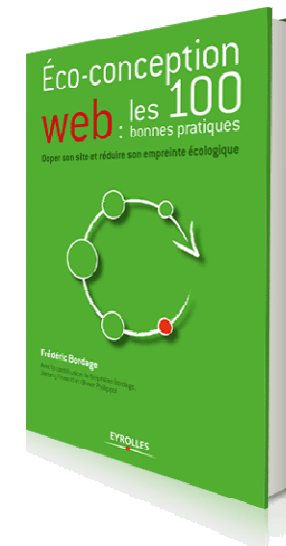
First historical player

- in Green IT and IT for Green (since 2004)
- in software eco-design (since 2009)

Other activities

- Conferences, books
- Software eco-design challenges
- Blog (www.greenit.fr)
- Lobbying (France, EU)

GreenIT.fr advises and supports companies such as Axa, ADEME, AFNOR, Banque Cantonale de Fribourg, EDF, Engie (GDF-Suez), Gemalto, Generali, BPCE group, La Poste, Pôle emploi, SNCF, Syntec, Total as well as institutions such as the State of Geneva, the European Commission, etc.



Some customers



- GreenIT.fr launched the Green IT movement in 2004, with first ever
 - stories and dedicated Green IT blog (GreenIT.fr)
 - conferences
 - white paper
 - consulting missions
 - ...
- For more than 11 years, we are working on projects such as
 - Global worldwide Green IT strategy
 - Performance and maturity audit, benchmark
 - Pure expertise (ex. french official methodology to evaluate and reduce ICT GHG emissions)
 - White papers, books, conferences, ...
 - for every kind of company : bank, insurance, industry, public service, ...

- GreenIT.fr launched the software eco-design movement in France in 2009, with first ever
 - Articles / stories
 - conference (Microsoft TechDays Paris, 2010)
 - Books and white papers (with AFDEL, D2SI, Syntec)
 - consulting missions
- For more than 6 years, we are working on projects such as
 - Bank: critical core business software used everyday by 40,000+ simultaneous users
 - Web: top 10 most visited french website with more than 2 billions visits per year
 - A public service: 80+ online services used by more than 30 millions people
 - Telecom: designing a webmail feature that help 18+ millions users save 350+ TB / year
 - European Commission: web site eco-design
 - ...
- Web eco-design best practices repository published in 2012
 - Hundreds of ecodesigned websites based on it
 - Supported by all software eco-design experts

Duration : 30 minutes

- Part 1. What are the impacts? When do they occur ?
- Part 2. Enlarge your lifespan is the key actions to reduce ICT impacts
- Part 3. Links between lifespan and software eco-design

Don't forget human beings

- Concentrated in
 - Minerals extraction : child soldier and slavery, « conflict minerals »
 - Building : unsafe / unhealthy working conditions
 - End of life : unsafe / unhealthy working conditions



Mineral extraction



Manufacturing



« Recycling »

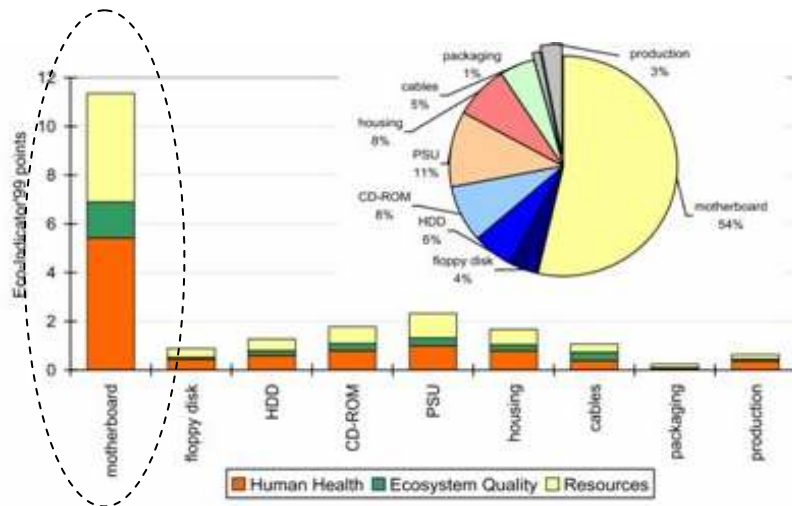


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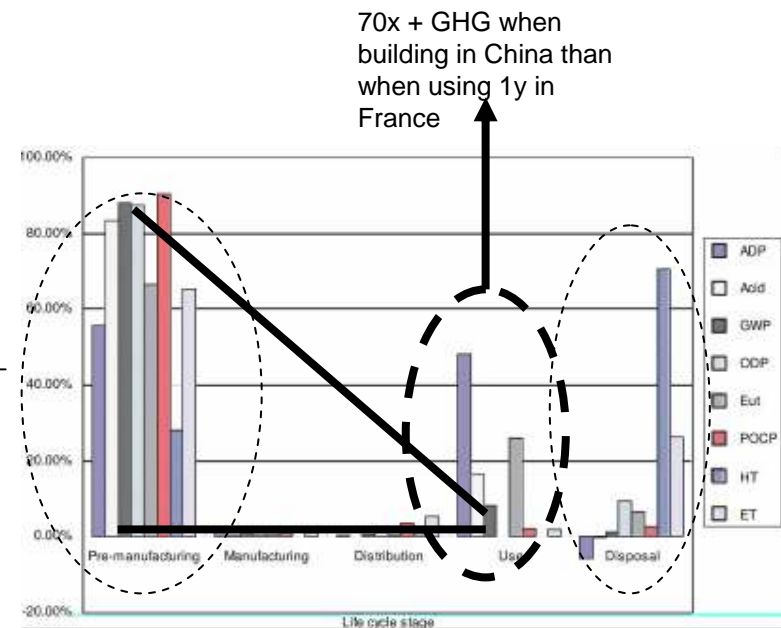
What impacts ? When ? Where ?

1. What impacts ? When ? Where ?

- Concentrated in
 - Manufacturing electronic components and flat screens
 - Biodiversity collapse thru all kinds of pollutions and their consequences : eutrophication, acidification, ...
 - Climate change (GHG)
 - Non renewable resources depletion (raw materials, energy, water, ...)
 - Use step impacts less (water, nuclear waste, GHG)



Impact environnemental des différents composants de l'UC d'un PC fixe, exprimé en points Eco-Indicator'99 source : Eugster et al, 2007



Contribution des différentes phases du cycle de vie d'une UC de PC coréen à chaque catégorie d'impact, avec un taux de recyclage de 46% - source : Choi et al, 2006

1. What impacts ? When ? Where ?

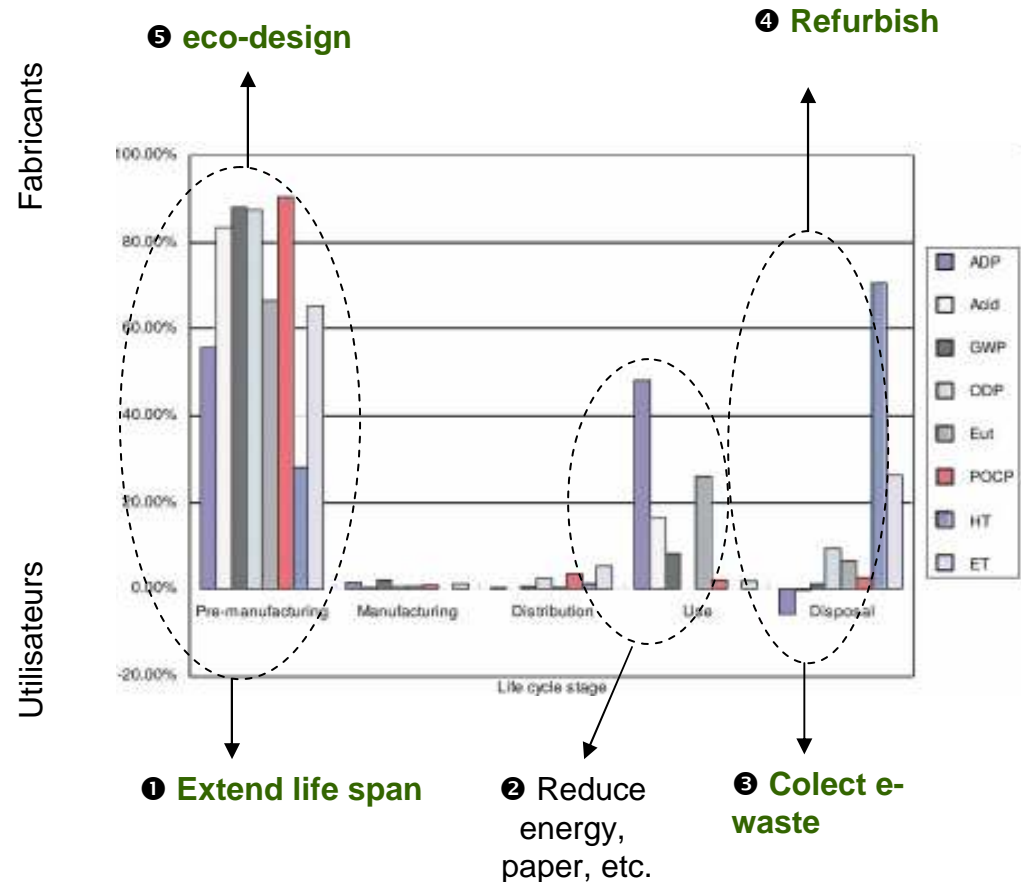
- Impact types depend on when occurring
- Raw materials extraction and electronic components manufacturing
 - Most impacts
 - All types of impacts : resources depletion, pollutions, climate change, etc.
- Assembling and distribution
 - Very few impacts (compared to previous and following stages)
- Use
 - Energy related impacts : water depletion, nuclear waste, climate change (very low in France)
- End of life
 - Pollutions
 - Depending how much is collected (less than 30 %) and how the recycling is done

1. Three ways to reduce ICT and online services footprint

- 3 complementary ways
 1. extend life span (priority)
 2. use less ICT (priority)
 3. reduce kWh / paper use
- 2 key actions
 - extend life span
 - Use IT longer, reuse
 - ecodesign
 - hardware
 - software



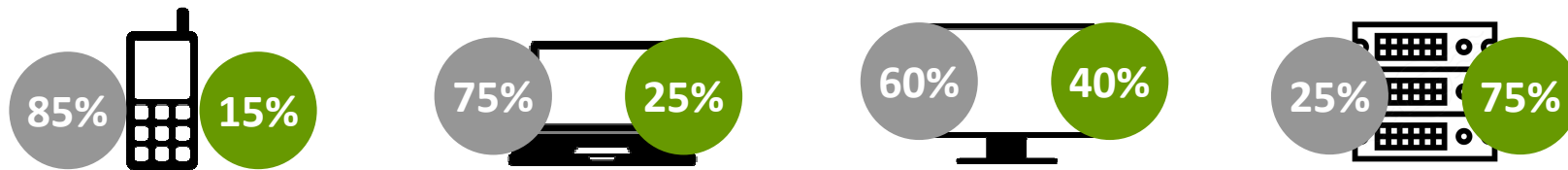
From an environmental point of view, power savings should NOT be a Green ICT priority in countries such as France.



Source : greenit.fr

1. Embodied energy and GHG emission factors

- Embodied energy
 - “sum of all the energy required to produce any goods or services, considered as if that energy was incorporated or 'embodied' in the product itself”.
 - The smaller, the more embodied energy.



- In many cases, extending lifespan save a lot of energy and much more GHG than switching off the device !

- GHG emission factors
 - France : 0,1 kg CO2 equivalent per kWh
 - OECD : 0,5 kg CO2 equivalent per kWh
 - China : 1 kg CO2 equivalent per kWh

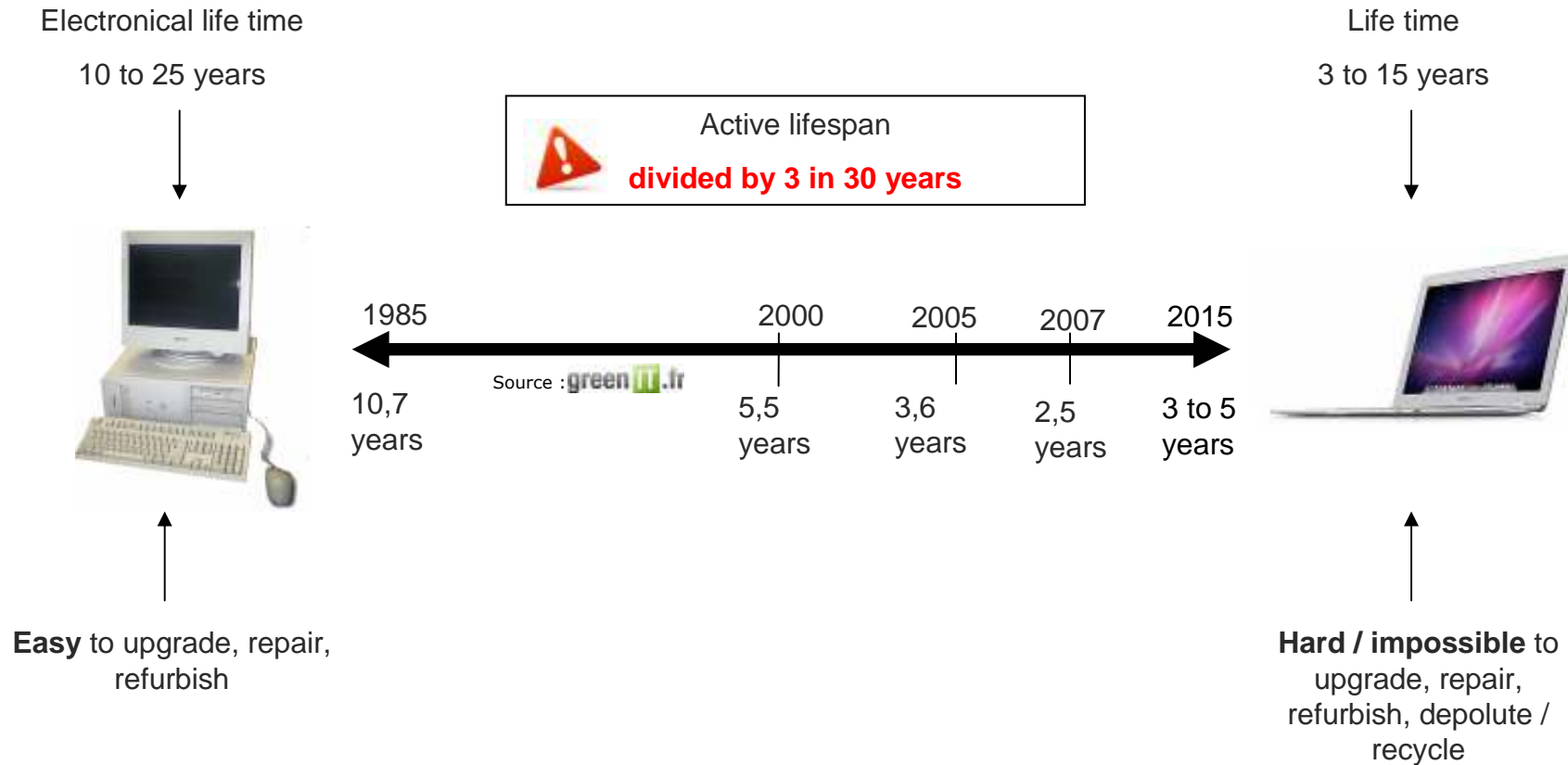


100x more GHG emissions building a laptop in China than using it 1 year in France (24x more for OECD country)

2

Enlarge your life span

2. Computer lifespan divided by 3 in 1 generation



2. Hardware design & form factor

2007



Crédit : IBM

Standardized
Interchangeable
User friendly
... components



2013



Crédit : Apple

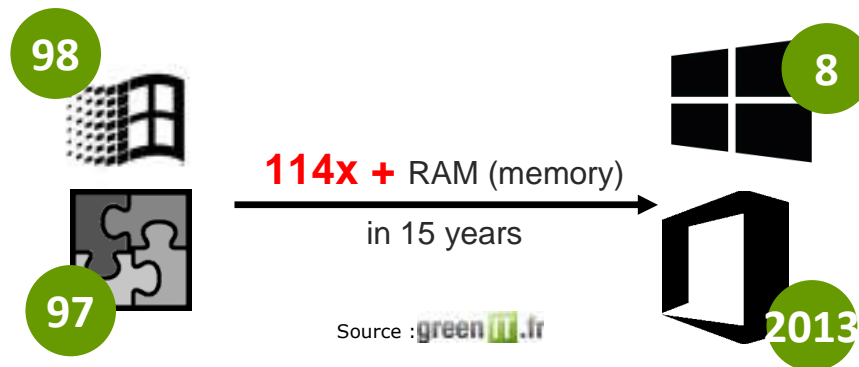
Proprietary screw (when exists)
Welded components
Prohibited by warranty terms

3

Links between lifespan and software eco-design

3. Bloatware

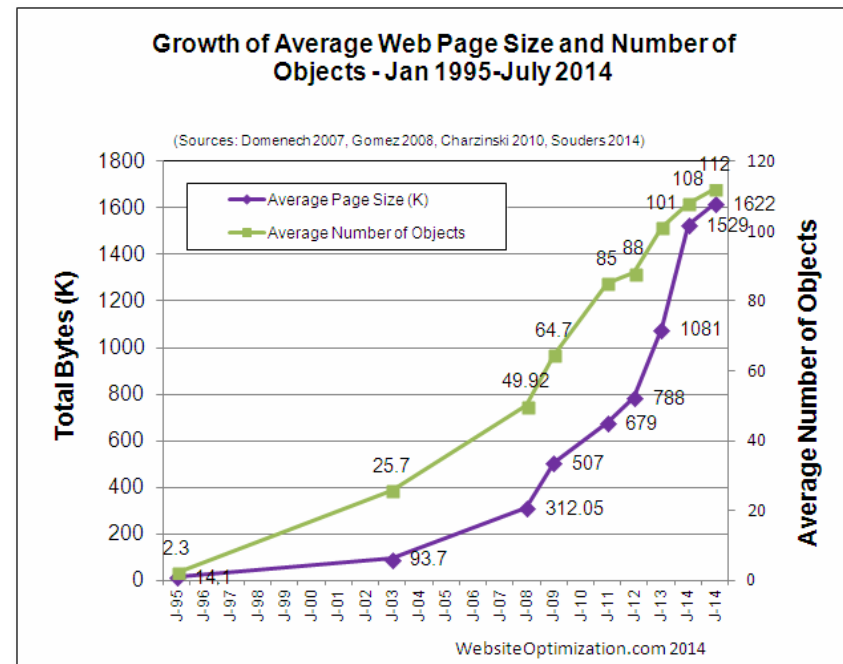
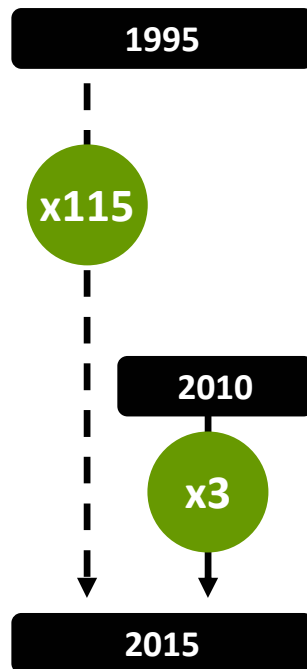
- Electronical life span is way longer than service life
 - Computers are not discarded / thrown away because they no longer work...
 - ... but because they are too slow to run new software versions.



- Imagine that you need a 114x more powerful engine to drive the same distance at the same speed !

3. WWW also is fat

- The average weight of a web page has been multiplied by
 - x3 between 2010 et 2015
 - x115 between 1995 et 2015



Source : <http://www.websiteoptimization.com/speed/tweak/average-web-page/>

4

Software eco-design

4. Find a website URL

FAIL



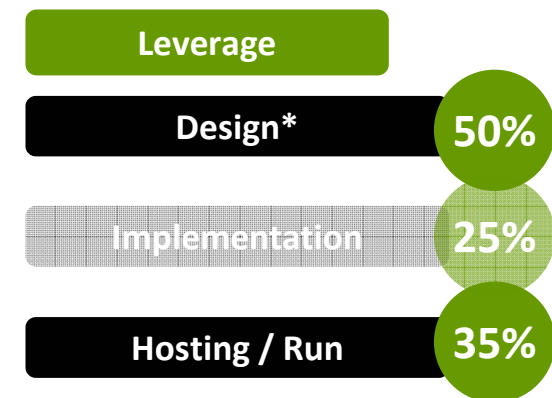
WIN



	Yahoo!	Google	différence
Weight (KB)	600 Ko	322 Ko	x2
HTTP requests	69	12	x5
Page load time (sec.)	11,6	3,8	X3
Eco-design grade	C	A	

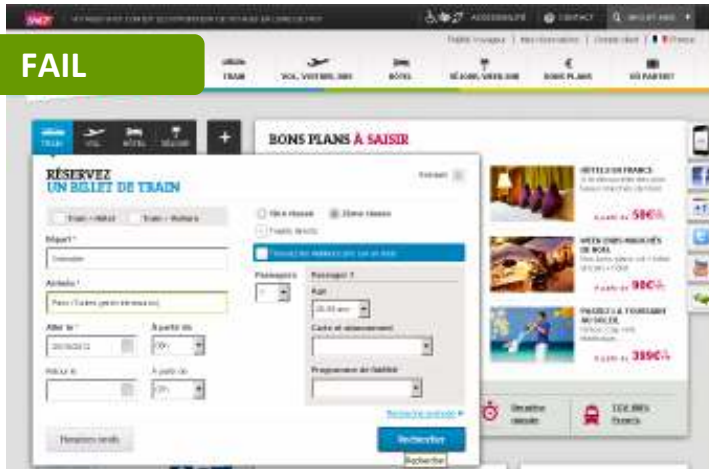
4. Software ecodesign: definition and scope

- Software ecodesign aims to reduce the amount of physical computing resources required to run a software.
 - Because impacts are concentrated in the manufacturing step.
 - Except for mobile apps, do not target to save power: better achieved by reducing the physical resources.
- Finding the roots of digital fat all along the life cycle and making a diet.
- It's all about
 - efficiency (not performance) ;
 - It's all about designing (not programming).
 - Don't focus on programming but around (before and after)

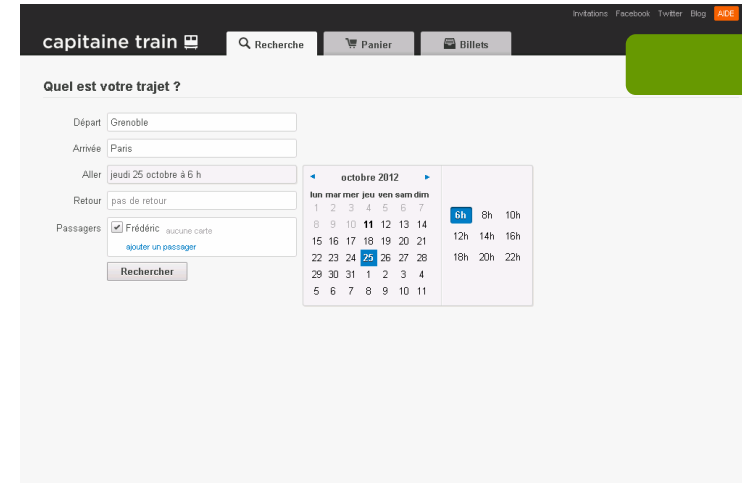


4. Book a train ticket

FAIL



WIN



	SNCF	CapitaineTrain	différence
Weight (KB)	4791	925	5x moins
HTTP requests	204	10	20x moins
Eco-design grade	F	B	

- Last try: november 2014

Analysis Error
 The page took too long to load
 GTmetrix tried to analyze the page, but it took longer than 2 minutes to finish loading. Try testing from a test location closer to your server.
 Please see our [FAQ](#) on how to fix this error.

Conclusion

- Consider the life cycle, impacts are not limited to GHG
 - Actually, in most cases, GHG is the lesser of two evils
 - Consider non renewable resources depletion and all kind of pollutions
- Reducing ICT footprint begins with
 - **Enlarging devices lifespan**
 - Because most impacts are concentrated in the manufacturing stage of the life cycle
- Do not focus on power saving in the use step via programming
 - This is merely 10% of the problem and not an interesting leverage.
- If you practice software eco-design
 - Don't skip the word « design »: focus on « before » and « after » the implementation step
 - Don't focus on energy but on hardware. Cause this is the best way to save energy.
 - If you don't work on the functional side, you miss the point.