



23 mei 2025

Groene vaardigheden in de digitale wereld

Nationale Coalitie Duurzame Digitalisering

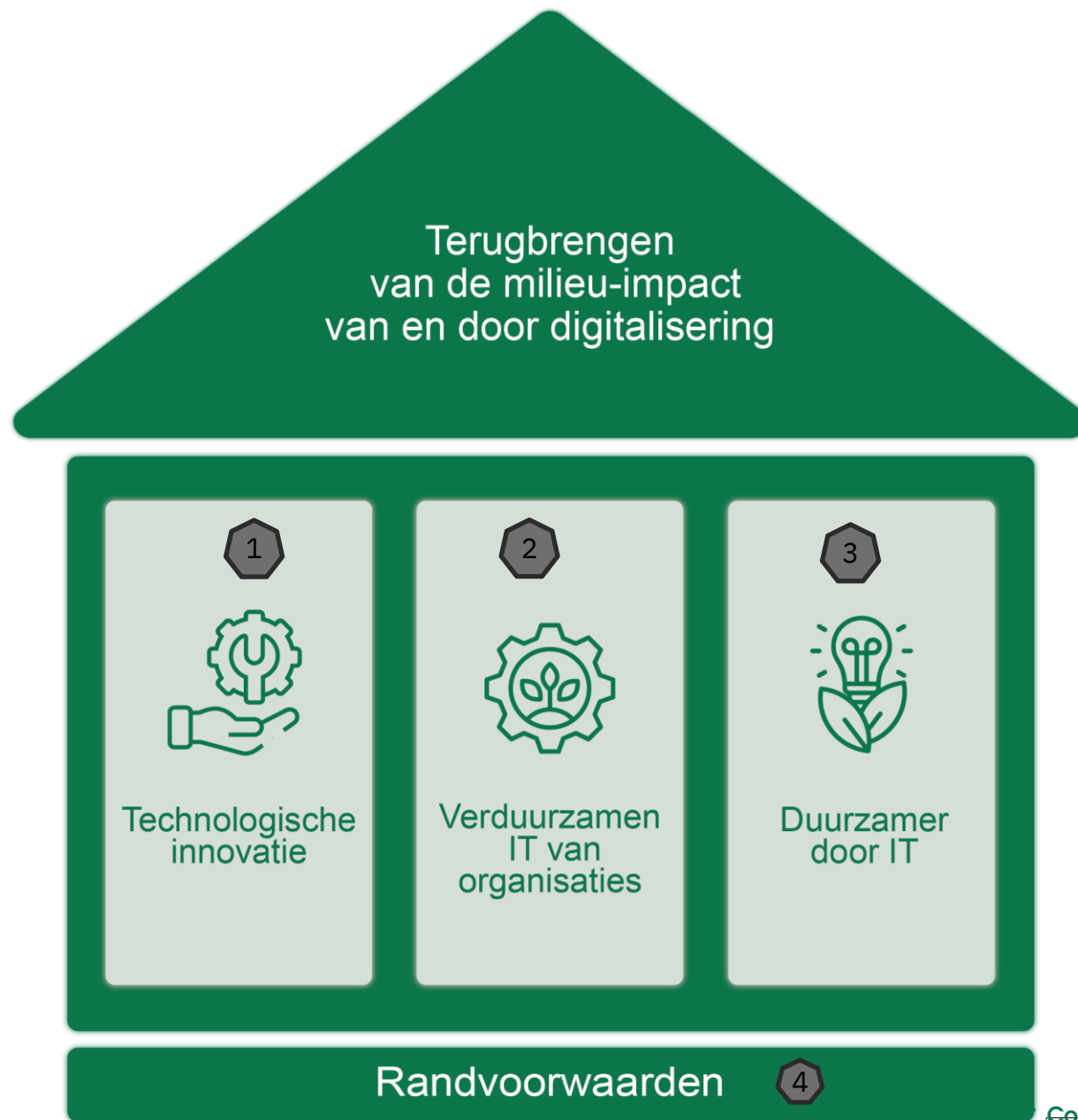
Programma

- Inleiding Coalitie Duurzame Digitalisering & werkgroep Kennis & Vaardigheden
- Ronald Meijer & Jan Schraevesande – IBM

Coalitie Duurzame Digitalisering

4 programmaliijnen

Aan de slag in
werkgroepen



Kennis en Vaardigheden



- Focus op duurzaamheidsaspecten van digitalisering in het onderwijs en de duurzaamheidscompetenties van de IT-professionals van morgen.
- Doel is om samen te werken om bewustzijn en kennis over het onderwerp zoveel mogelijk in curricula te doen opnemen.



**Coalitie
Duurzame
Digitalisering**

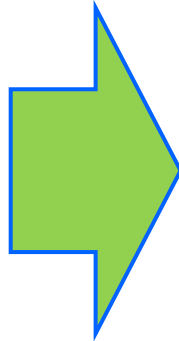
Sustainable IT is not an illusion!

Ronald Meijer
Jan Schravessande



The IT industry has a big impact on the planet

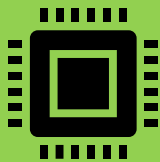
Carbon emission



Currently IT produces as much Carbon emission as the aviation industry! (approx. 4% of total CO2 emission)



If this emission trend continuous (as it certainly will), in 2040 IT will be responsible for **14%** of worlds CO2 emissions!

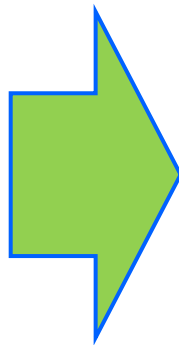


We need to address this issue and start to become more aware of the impact of using IT resources without restrictions:

Howe much data do we need and how much data do we store?
What do we compute and how often do we compute?
Reconsider the use AI for everything

The IT industry has a big impact on the planet

Energy usage



Worldwide, datacenters use approx. 1,3% electricity. In the Netherlands we use 3,3% (3,7 TWh)



There are myths around AI and energy consumption. But, forecast is Data centers will use 8% electricity by 2030.



ChatGPT uses 10 times as much energy as a normal (Google) search.

More than 100 countries use less energy than ChatGPT

Motivatie



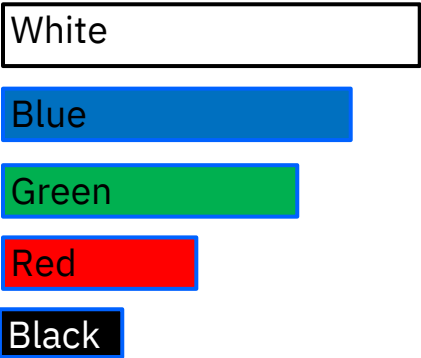
Often we refer to sustainability in context of saving energy....
Nothing wrong with that, but is this the right motivation for sustainability?

Saving energy from a economic perspective introduces the propability that one falls back in old habits when energy prices are normalized again.

Cost of energy is no longer pressing on profitmarges or on ones houshold wallet and we're back to 'business as usual'.

DID YOU KNOW?

Colors have a different
Impact on battery life
on devices with OLED
displays :



Blue pixels use
25% more energy
than Red pixels

Design

AI as hype

Are we using AI for
everything?

Can we achieve the
same results with
simple business
rules?

AI require significant
compute power for
training and running
models

Keep models small

Compute

Approx 80% of
emissions emerge
during **development**
phase of a product.

Lenovo Thinkpad,
2021 - 81%:
Dell Latitude, 2019 -
75%
of the emissions
emerge during
production

Lifecycle

Approx 65% of all
collected and stored
data is **used** in
production
environments



Store

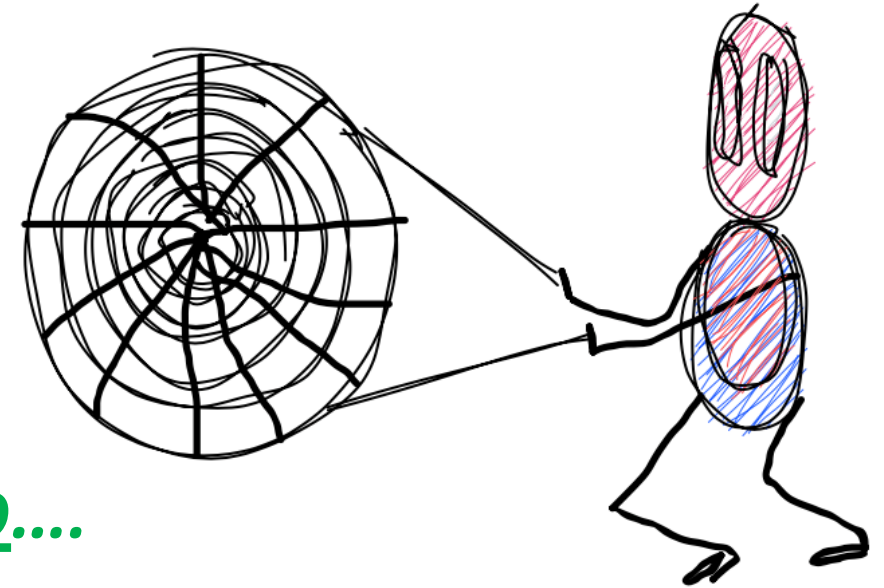


The human factor: you and Iwe have our own responsibility!

In the movie **Spiderman**, Uncle Ben says to Peter Parker (Spiderman):

'With great power comes great responsibility'

You have great powers, you can be a super hero....



EACH PERSON, EACH ROL CAN HAVE A POSITIVE IMPACT ON SUSTAINABLE USE OF IT!

Specialists, architects, programmers etc, have a lot of power in their field of expertise.

YOU have impact on sustainability!

Domains Roles	Data-center	Infra-structure	Code	Data Usage	Systems	Impact
Architect: Business						
Architect: Application						
Architect: Infrastructure						
IT Specialist: Programmer						
IT Specialist: Data Scientist						
IT Specialist: Infrastructure						
Product Owner						
CSO						

The Architect:

- Non-functional requirements
- Sustainability aspects
- Define architecture for sustainable IT

The specialist:

- Developer
- Data scientist
- Infrastructure specialist
- Realise sustainable IT solutions

Directional
I demand
sustainability
requirements

I follow
sustainability
principles

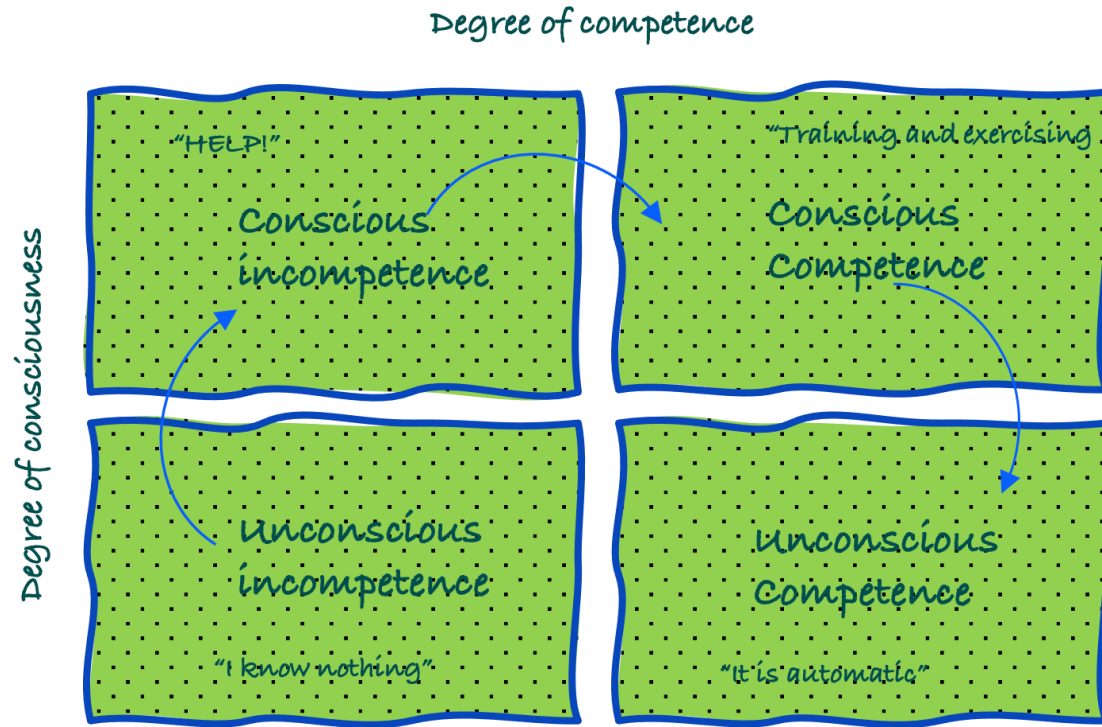
Operational
I build in a
sustainable way

I deliver a
sustainable
solution

Sustainability
manifesto



The four stages of competence.



Promoting through this model:

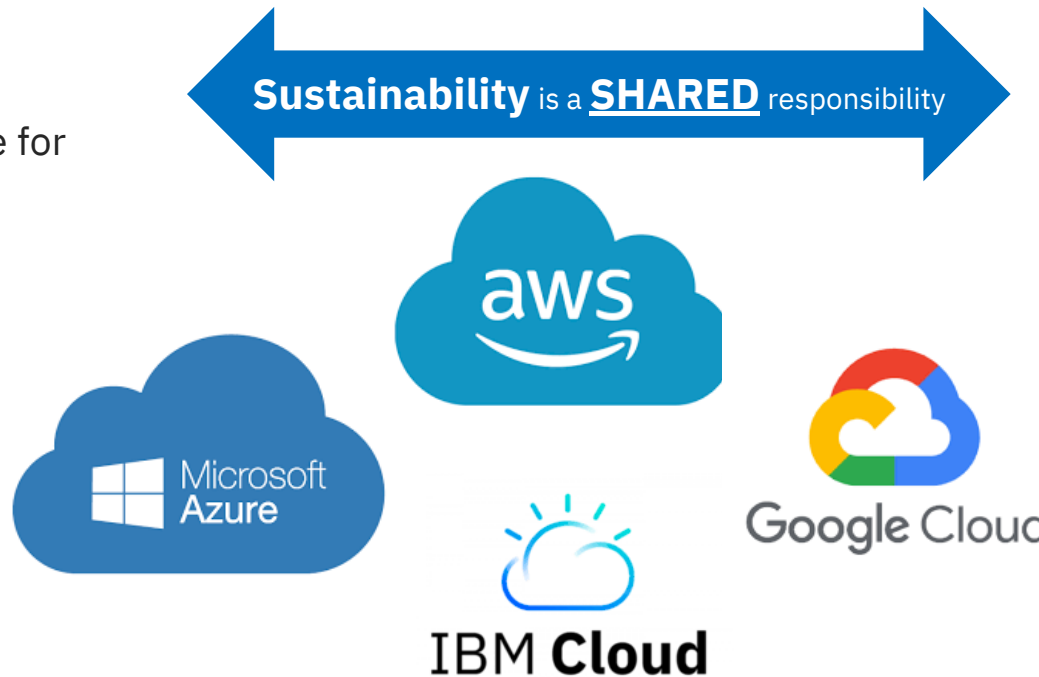
- From unconscious incompetence to conscious incompetence:
Read our book!
- From conscious incompetence to conscious competence:
Implement a behaviour manifesto, architectural principles and a sustainability strategy.
- From conscious competence to unconscious competence:
Transform and go through a culture change.

WHERE ARE YOU IN THIS MODEL?

If you're organisation is not responsible for housing or hosting of IT systems it does not mean you are dismissed from (a shared) responsibility for sustainability aspects (Niklas Sundberg)

AWS, Azure, IBM, Google... are responsible for sustainability **OF** the cloud

- Waste
- Data Centres
- Cooling
- Electricity Supply
- Servers
- Water
- Building Materials

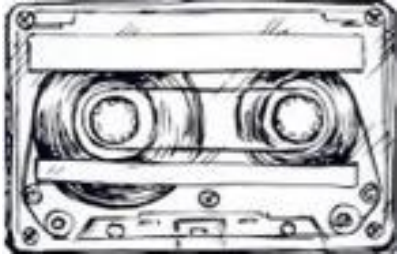


Customer is responsible for sustainability **IN** the cloud

- Platform Deployments & Scaling
- Software Application Design
- Data Design & Usage
- Data Storage
- Code Efficiency
- Utilization & Scaling

Use IT resources wisely...!

IT 'bad habits' and anti-patterns



Tape might be old-fashioned, but it is still a very sustainable storage medium.

Tape manufacturers usually quote the lifespan of their LTO tapes at about 30 years.

Tape Storage reduces eWaste by 80% because it has a 10-year lifespan instead of the average 5.2-year HDD lifespan.



**Consider the use of tape technology:
Is there a real need for all data to be
available in a split second....or is 18
seconds fast enough....?**

Anti-patterns for sustainability:

- *Always on*
- *Decommission after three years*
- *High availability patterns for any workload*



Always off is standard

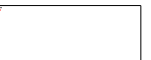
Turn systems off when they are not in use and safe on unnecessary energy consumption.

Extend the technical lifespan of infrastructure:

Infrastructure is technical robust. There is no explicit need for a technical depreciation after three or four years.

Implement workloads on basis of SLA requirements:

Avoid using over-dimensioned patterns for workloads with low SLA requirements.



Efficiency of Programming Languages

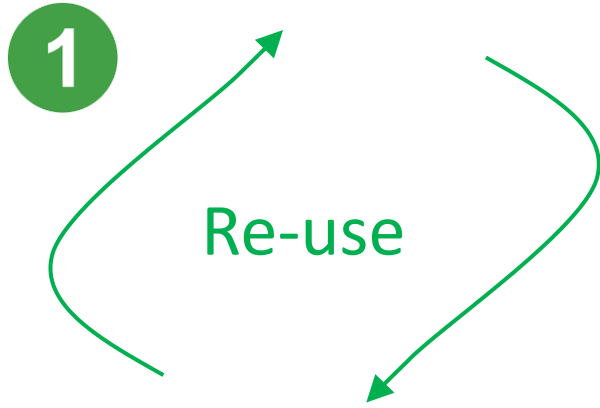
- Compiled
- Interpreted

<https://thenewstack.io/which-programming-languages-use-the-least-electricity/>

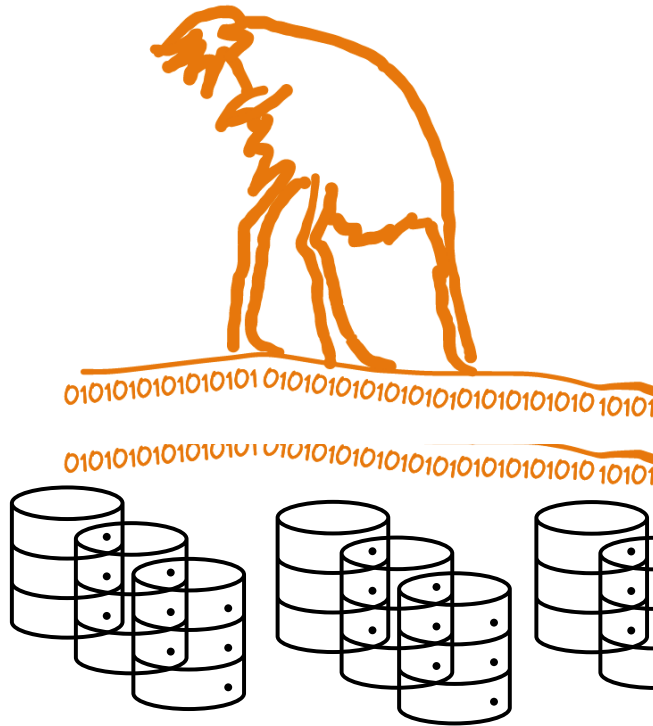
Table 4. Normalized global results for Energy, Time, and Memory

Total					
	Energy		Time		Mb
(c) C	1.00	(c) C	1.00	(c) Pascal	1.00
(c) Rust	1.03	(c) Rust	1.04	(c) Go	1.05
(c) C++	1.34	(c) C++	1.56	(c) C	1.17
(c) Ada	1.70	(c) Ada	1.85	(c) Fortran	1.24
(v) Java	1.98	(v) Java	1.89	(c) C++	1.34
(c) Pascal	2.14	(c) Chapel	2.14	(c) Ada	1.47
(c) Chapel	2.18	(c) Go	2.83	(c) Rust	1.54
(v) Lisp	2.27	(c) Pascal	3.02	(v) Lisp	1.92
(c) Ocaml	2.40	(c) Ocaml	3.09	(c) Haskell	2.45
(c) Fortran	2.52	(v) C#	3.14	(i) PHP	2.57
(c) Swift	2.79	(v) Lisp	3.40	(c) Swift	2.71
(c) Haskell	3.10	(c) Haskell	3.55	(i) Python	2.80
(v) C#	3.14	(c) Swift	4.20	(c) Ocaml	2.82
(c) Go	3.23	(c) Fortran	4.20	(v) C#	2.85
(i) Dart	3.83	(v) F#	6.30	(i) Hack	3.34
(v) F#	4.13	(i) JavaScript	6.52	(v) Racket	3.52
(i) JavaScript	4.45	(i) Dart	6.67	(i) Ruby	3.97
(v) Racket	7.91	(v) Racket	11.27	(c) Chapel	4.00
(i) TypeScript	21.50	(i) Hack	26.99	(v) F#	4.25
(i) Hack	24.02	(i) PHP	27.64	(i) JavaScript	4.59
(i) PHP	29.30	(v) Erlang	36.71	(i) TypeScript	4.69
(v) Erlang	42.23	(i) Jruby	43.44	(v) Java	6.01
(i) Lua	45.98	(i) TypeScript	46.20	(i) Perl	6.62
(i) Jruby	46.54	(i) Ruby	59.34	(i) Lua	6.72
(i) Ruby	69.91	(i) Perl	65.79	(v) Erlang	7.20
(i) Python	75.88	(i) Python	71.90	(i) Dart	8.64
(i) Perl	79.58	(i) Lua	82.91	(i) Jruby	19.84

Four 'sustainable' design patterns



What we see, is a typical Ostrich behavior.....!



A **huge amount of data** that has never seen the light of day and which **probably never**, ever **going to fulfil its promises** to lead to the **holy grail of insights**.

Despite the big promises, efforts and **wasted energy** to store and move the data and keep it available.....

- Unnecessary collecting of data => the more data the better...
- Expensive non-sustainable storage solutions => accessible any time any place.... and fast....
- Unethical use of data => let's try this and let's try that.....

Sustainable data storage patterns examples.



Data duplication – Remove unnecessary copies of data



Storage tiering – Use appropriate storage device for storing data (eg Operational data, reporting and archive)



Storage virtualization – Prevent unnecessary copies of data and / or longer lifecycles of storage devices



Compression – Reduce physical storage footprint

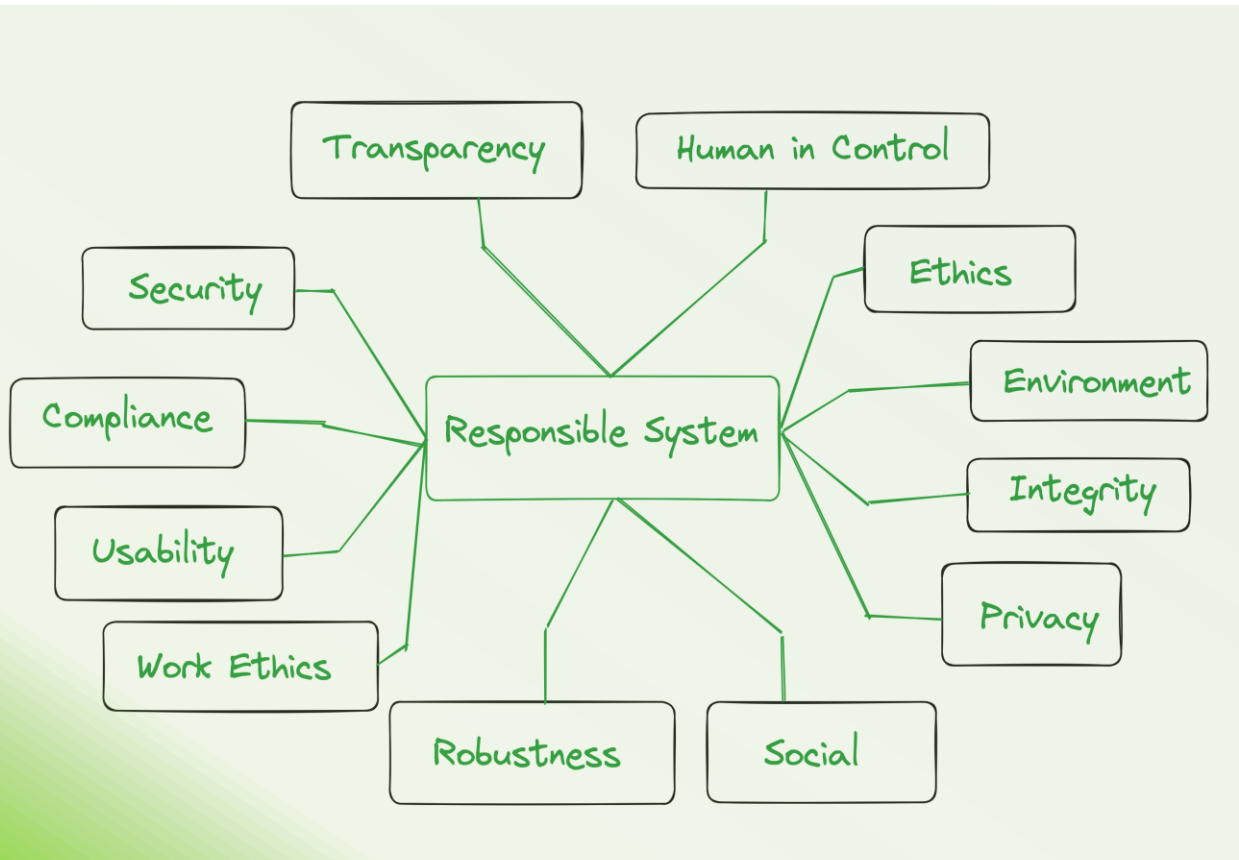


Overcommitting – Optimizing physical storage



..

A responsible system has many sustainability aspects.



Responsible System Aspects



- Secure by Design (Zero trust ?)
- Transparent. Clarity on how the system got to the result
- Human in Control. The action is always in control by the human
- Ethics. The system is not biased
- Environment. CO2 footprint
- Integrity. All actions are completed
- Privacy. Complies to GDPR
- Social. Is in line with the expectations of the society (inclusive)
- Robust. Is resistant to external manipulations
- Ethos. Aligns with the way of working of the workforce
- Usable. User friendly
- Compliance. Complies to the law and regulations.

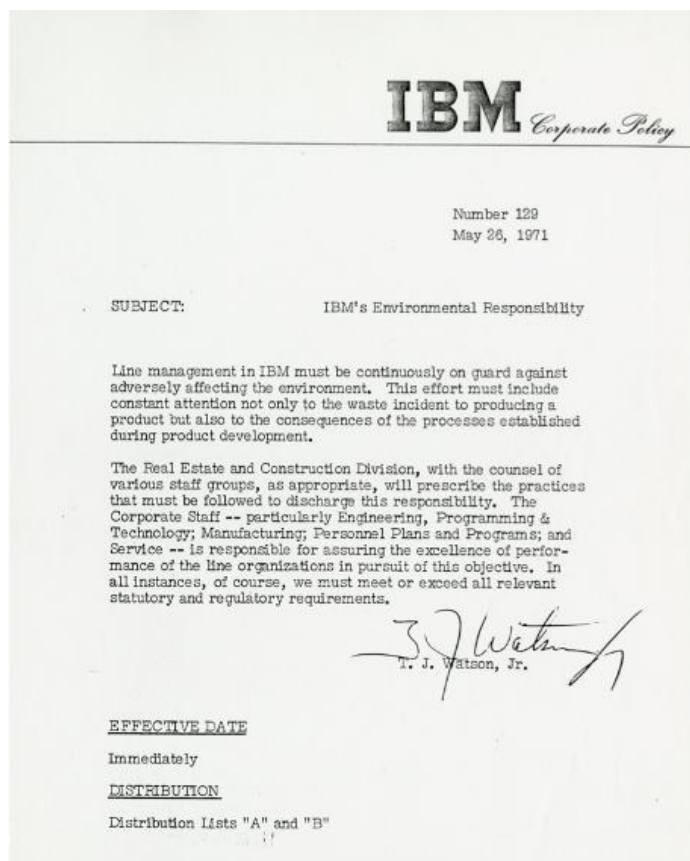
Set up sustainability principles in response to the various aspects relevant to a responsible system!

We are TECH. Why do we tell this story?

We want to be relevant in the sustainability discussion!



1. It is in our DNA
2. We have technology
3. We have a point of view



LinuxOne



Power Systems
Open Innovation to Put Data to Work

IBM



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<https://github.com/OrangeSeries/Sustainability>





Doe ook mee!

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