AI faces planetary limits: what can we do?

Part 1. The situation

Part 2. The actions

*Redefine, dimension**,***
*engage **and rebuild.***

Romain COUILLET, Univ. Grenoble-Alps *romain.couillet@univ-grenoble-alpes.fr*

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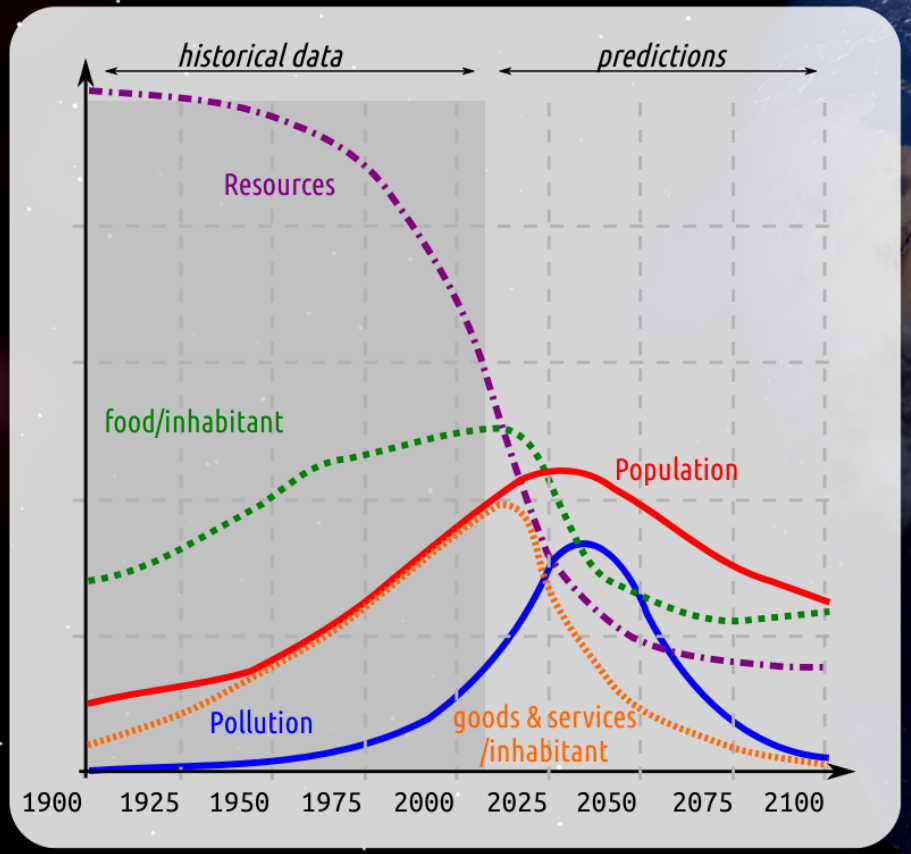
The "World3" model: scenario 0



Scenario 0 "Business as usual"

Goods/services

Pollution

Resources used to fight against pollution

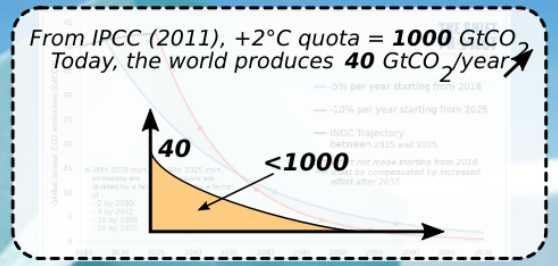
Goods/services

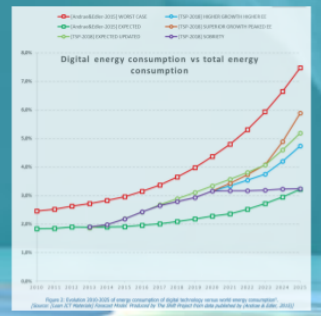
food production

population collapse

Meadows, D., & Randers, J. (2012). The limits to growth: the 30-year update. Routledge.

IPCC, digital and AI





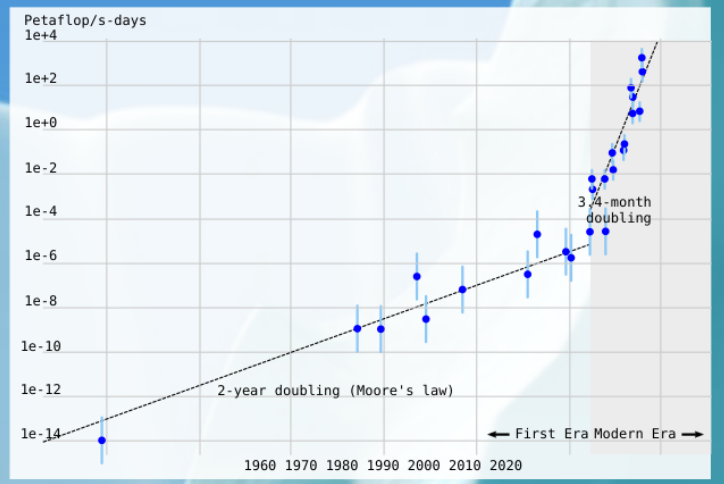


Figure 8: Evolution of shares of traffic 2016-2021
[Source: (Cisco, 2017a)]

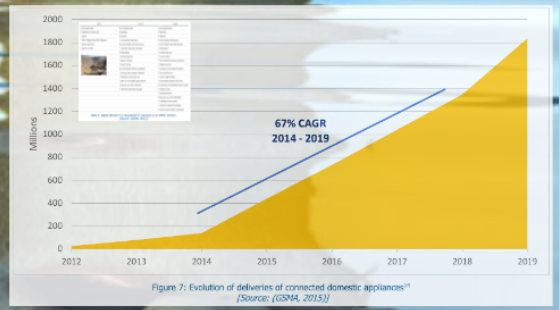
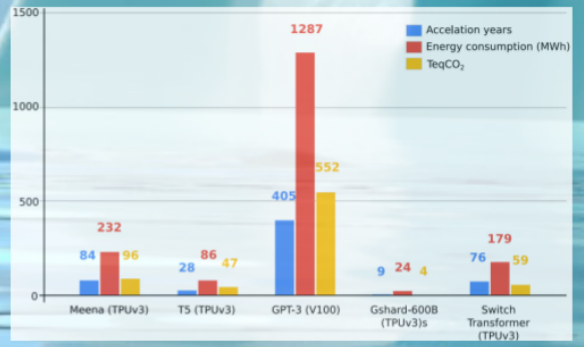
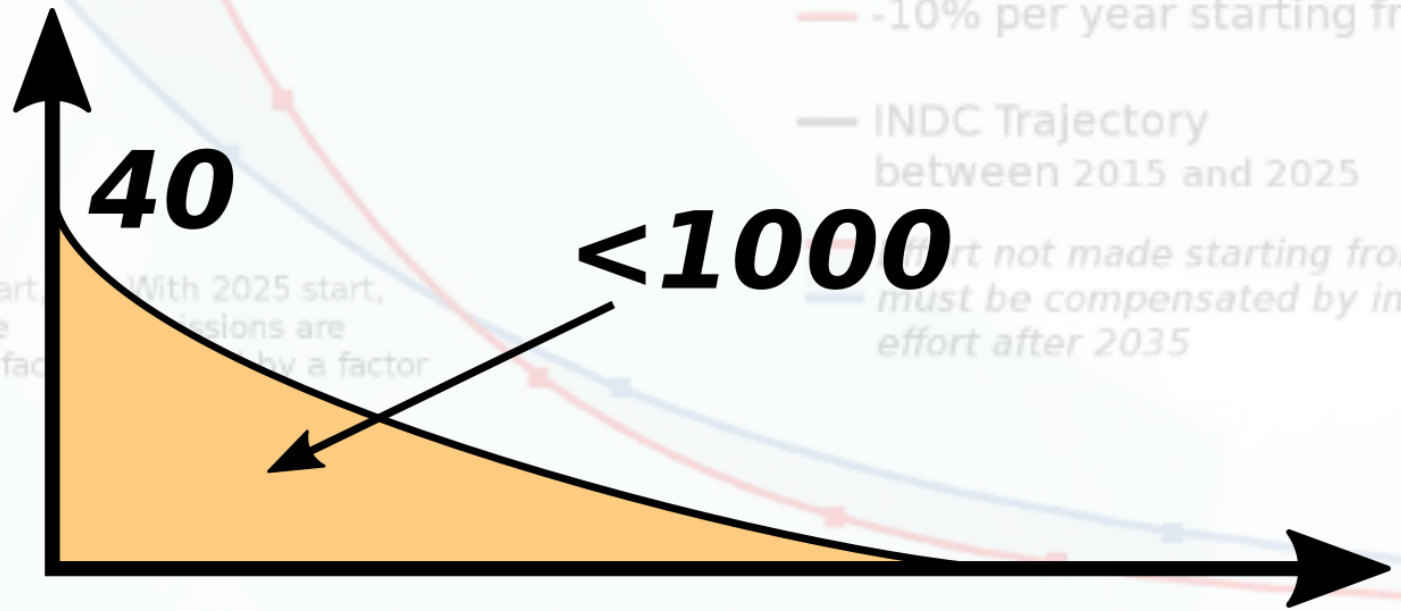


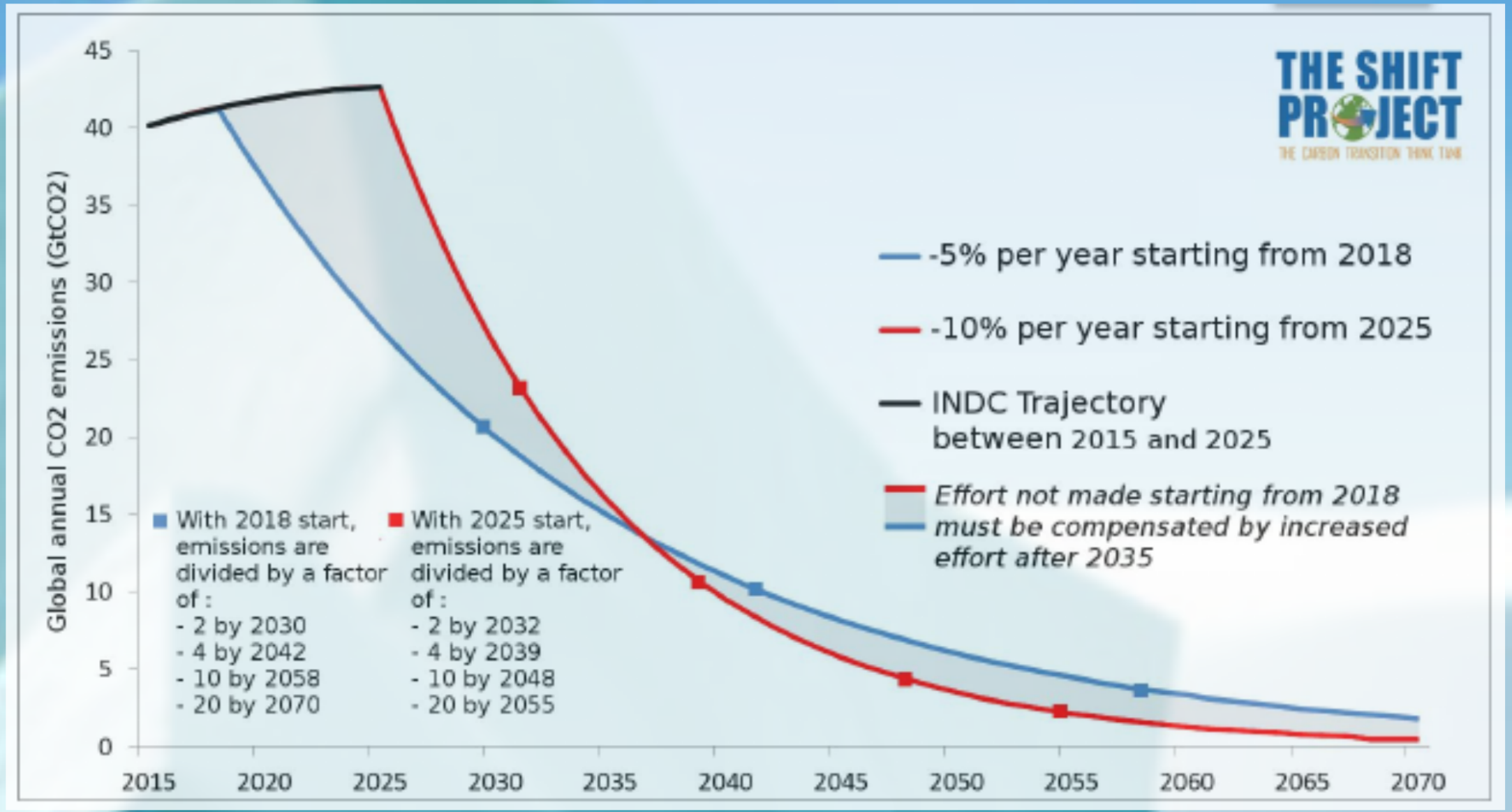
Figure 7: Evolution of deliveries of connected domestic appliances[1]
[Source: (GSMA, 2015)]



*From IPCC (2011), +2°C quota = **1000** GtCO$_2$*

*Today, the world produces **40** GtCO$_2$/year*




THE SHIFT PROJECT
THE CARBON TRANSITION THINK TANK
Global annual CO2 emissions (GtCO2)
45
40
35
30
25
20
15
10
5
0
2015
2020
2025
2030
2035
2040
2045
2050
2055
2060
2065
2070
-5% per year starting from 2018
-10% per year starting from 2025
INDC Trajectory between 2015 and 2025
Effort not made starting from 2018 must be compensated by increased effort after 2035
With 2018 start, emissions are divided by a factor of :
- 2 by 2030
- 4 by 2042
- 10 by 2058
- 20 by 2070
With 2025 start, emissions are divided by a factor of :
- 2 by 2032
- 4 by 2039
- 10 by 2048
- 20 by 2055

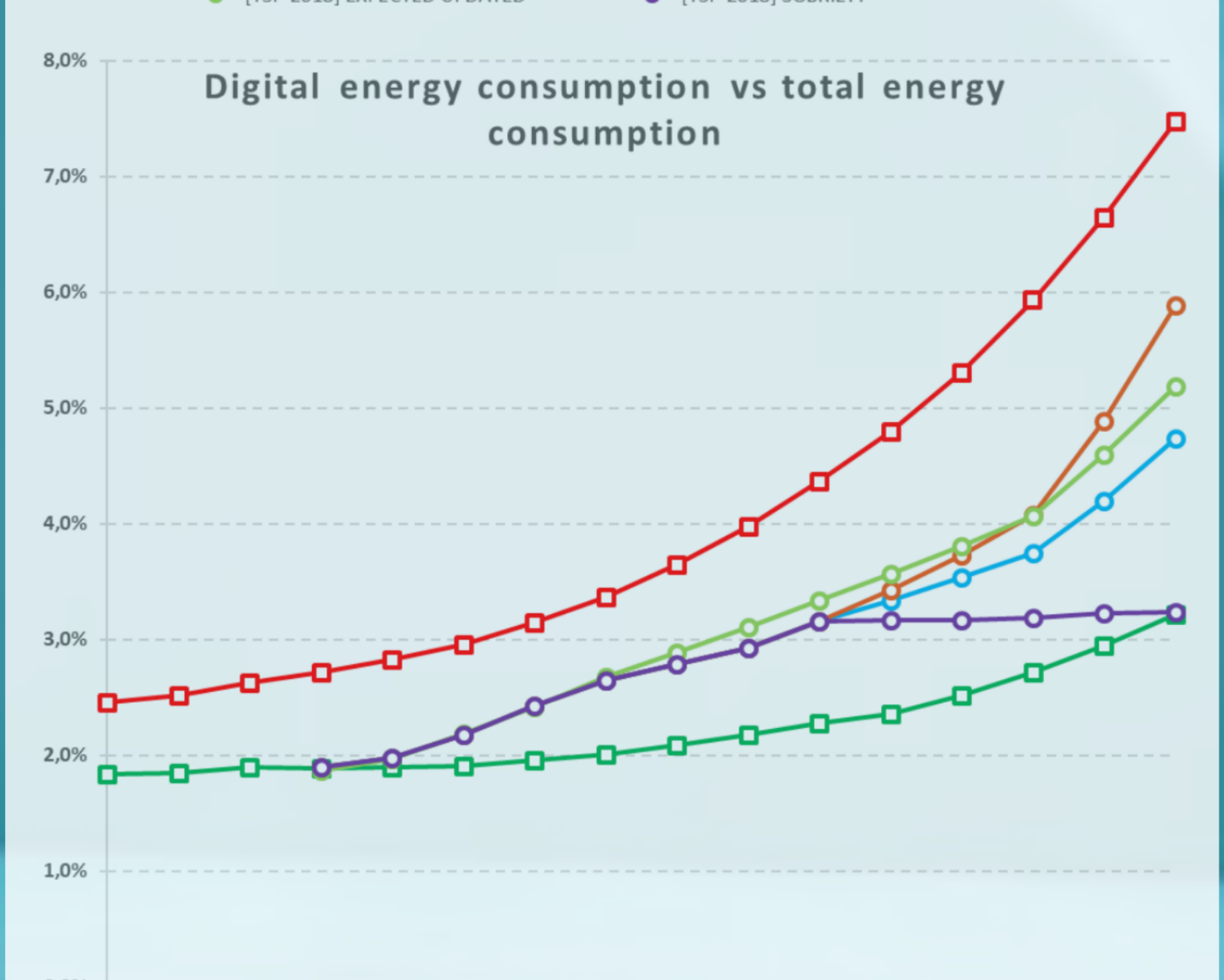

Digital energy consumption vs total energy consumption
8,0%
7,0%
6,0%
5,0%
4,0%
3,0%
2,0%
1,0%

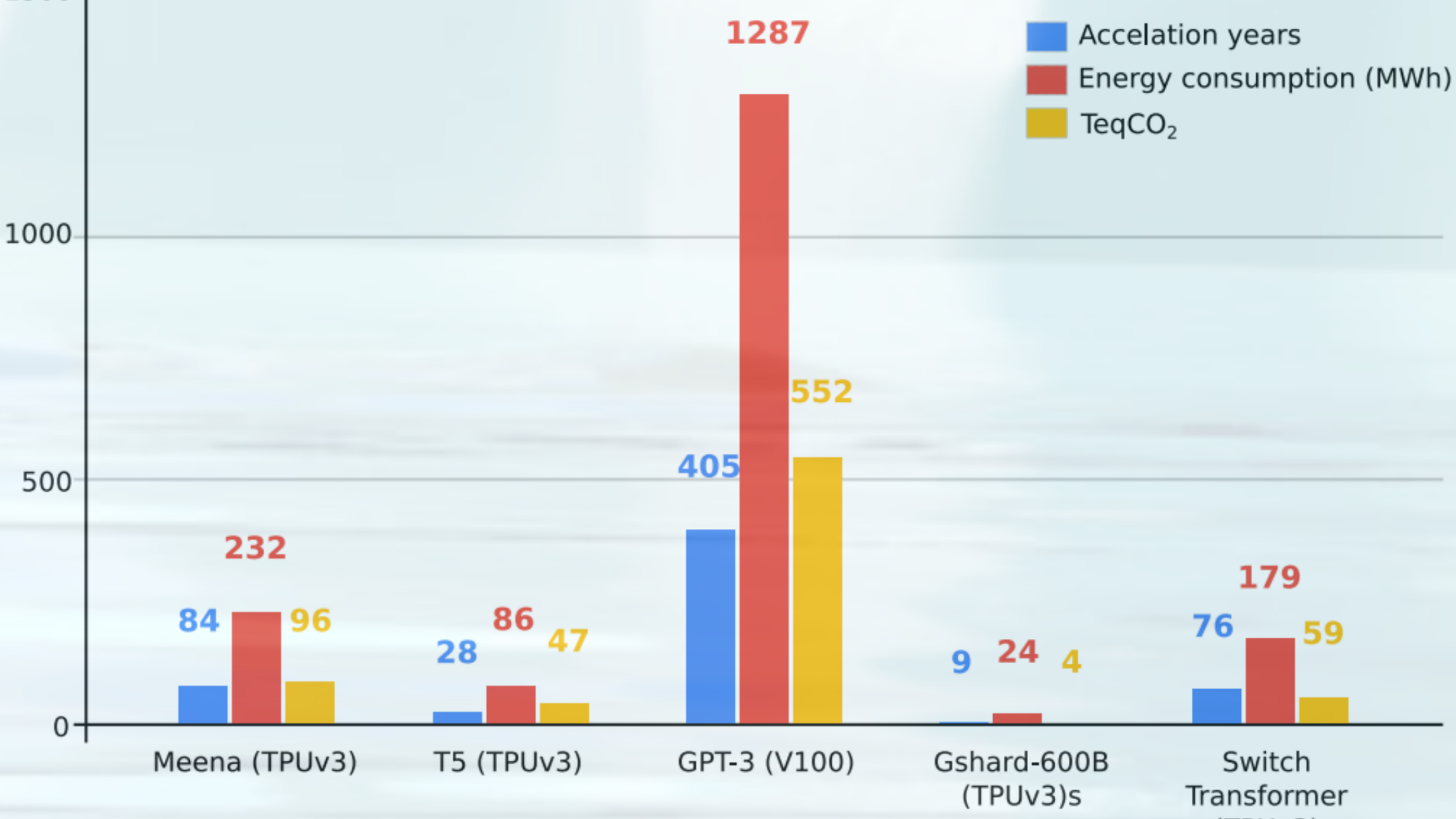
Figure 8: Evolution of shares of traffic 2016-2021
[Source: (Cisco, 2017a)]

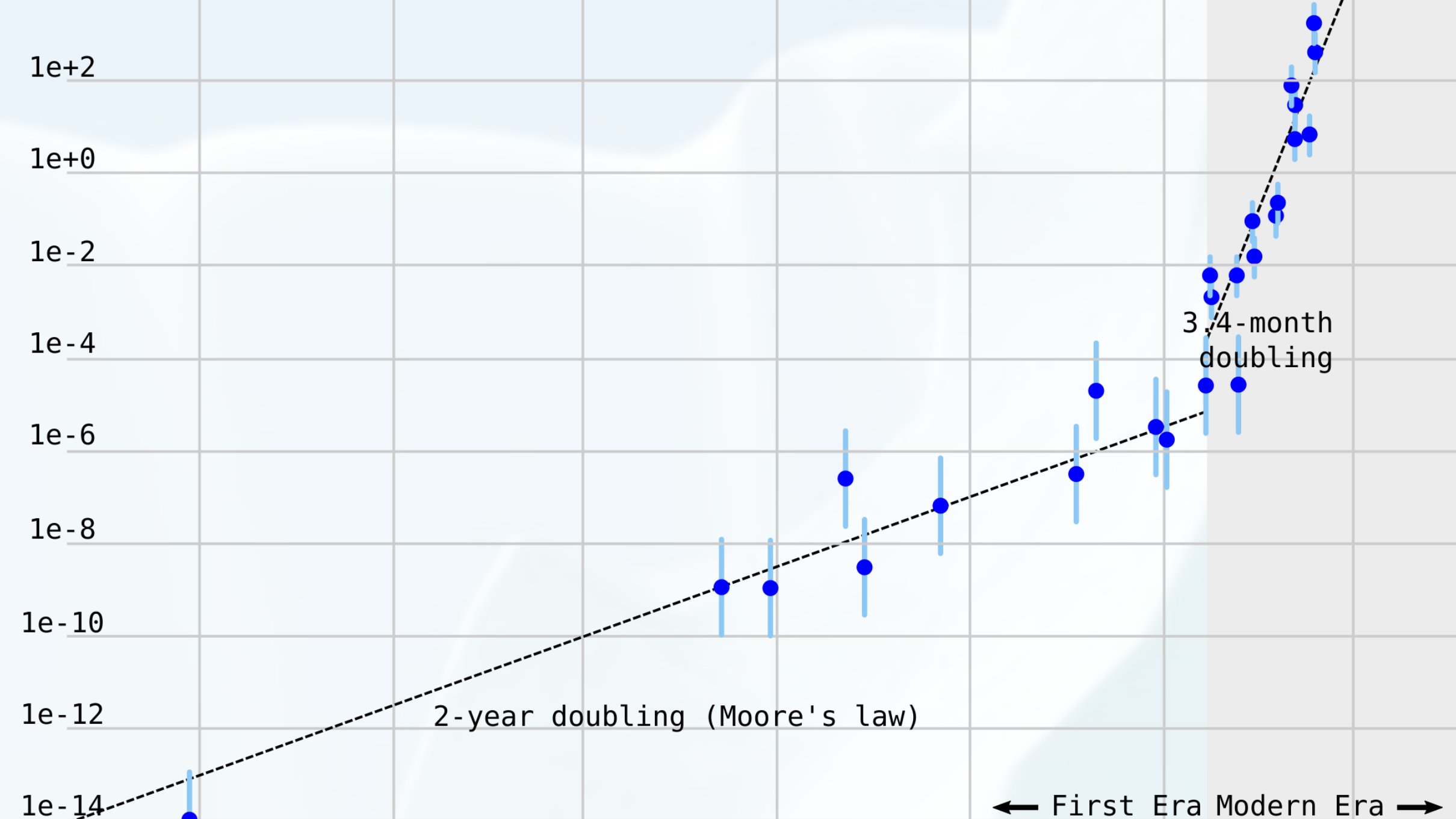
2012	2017	2022
2 smartphones	4 smartphones	4 smartphones
2 laptops/computers	2 laptops	2 laptops
1 tablet	2 tablets	2 tablets
1 DSL/Cable/Fibre/Wifi Modem	1 connected television	3 connected television
1 printer/scanner	2 connected set-top boxes	3 connected set-top boxes
1 game console	1 network attached storage	2 eReaders
	2 eReaders	1 printer/scanner
	1 printer/scanner	1 smart metre
	1 game console	3 connected stereo systems
	1 smart metre	1 digital camera
	2 connected stereo systems	1 energy consumption display
	1 energy consumption display	2 connected cars
	1 Internet connected car	7 smart light bulbs
	1 pair of connected sport shoes	3 connected sport devices
	1 pay as you drive device	5 internet connected power sock
	1 network attached storage	1 weight scale
		1 eHealth device
		2 pay as you drive devices
		1 intelligent thermostat
		1 network attached storage
		4 home automation sensors

Table 4: Digital devices in a household of 4 persons in an OECD country.
[Source: (GSMA, 2015)]

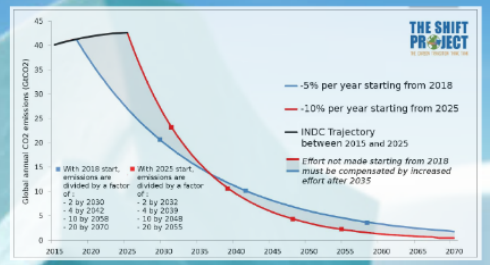
Figure 7: Evolution of deliveries of connected domestic appliances[14]
[Source: (GSMA, 2015)]

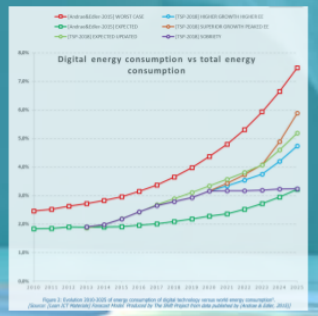
2 laptops/computers	2 laptops	2 laptops
1 tablet	2 tablets	2 tablets
1 DSL/Cable/Fibre/Wifi Modem	1 connected television	3 connected television
1 printer/scanner	2 connected set-top boxes	3 connected set-top boxes
1 game console	1 network attached storage	2 eReaders
	2 eReaders	1 printer/scanner
	1 printer/scanner	1 smart metre
	1 game console	3 connected stereo systems
	1 smart metre	1 digital camera
	2 connected stereo systems	1 energy consumption display
	1 energy consumption display	2 connected cars
	1 Internet connected car	7 smart light bulbs
	1 pair of connected sport shoes	3 connected sport devices
	1 pay as you drive device	5 internet connected power sock
	1 network attached storage	1 weight scale
		1 eHealth device
		2 pay as you drive devices
		1 intelligent thermostat
		1 network attached storage
		4 home automation sensors

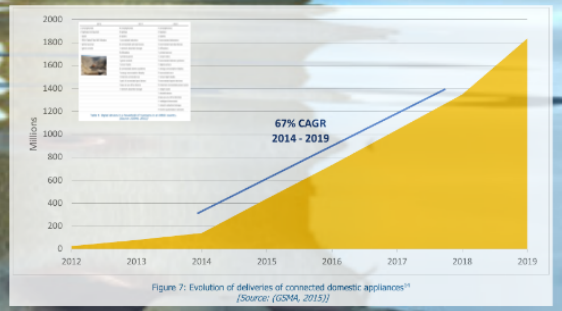

Accelation years
Energy consumption (MWh)
TeqCO2
1000
500
0
84
232
96
28
86
47
405
1287
552
9
24
4
76
179
59
Meena (TPUv3)
T5 (TPUv3)
GPT-3 (V100)
Gshard-600B (TPUv3)s
Switch Transformer

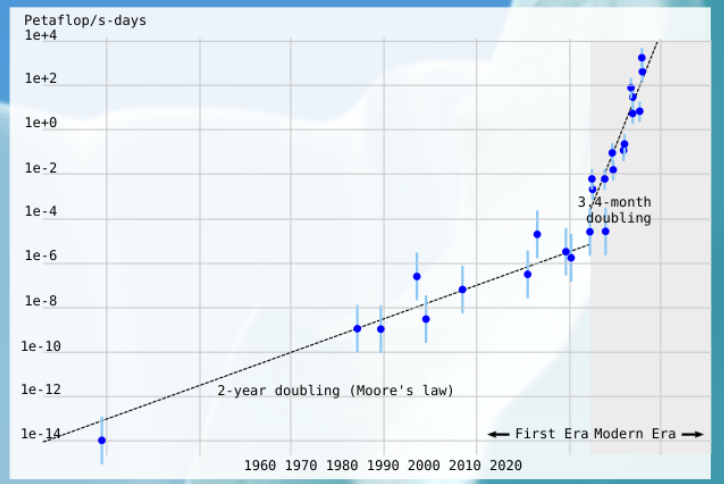

1e+2
1e+0
1e-2
1e-4
1e-6
1e-8
1e-10
1e-12
1e-14
3.4-month
doubling
2-year doubling (Moore's law)
First Era Modern Era

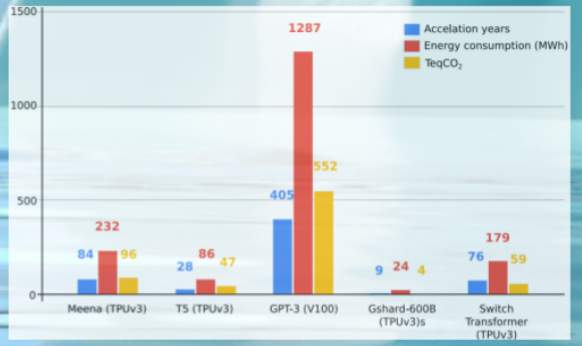
IPCC, digital and AI











Tools for conviviality

Illich, I. (1973). Tools for conviviality

Definition of a "convivial tool"

1. Extends their user.
2. Remains a means, ***not a need***.
3. Does not induce inequalities of access.

Is not convivial (why?)

Thermo-industrial society.
Personnal car.
Modern science.
Western health system.
Western school system.

How to build a convivial society?

Radical monopoly!

Bikes ***(2kWh/100p-km)***

1. Increase accessible space.
2. Reparable, no external energy.
3. Low cost, accessible to all.

Cars ***(80kWh/100p-km)***

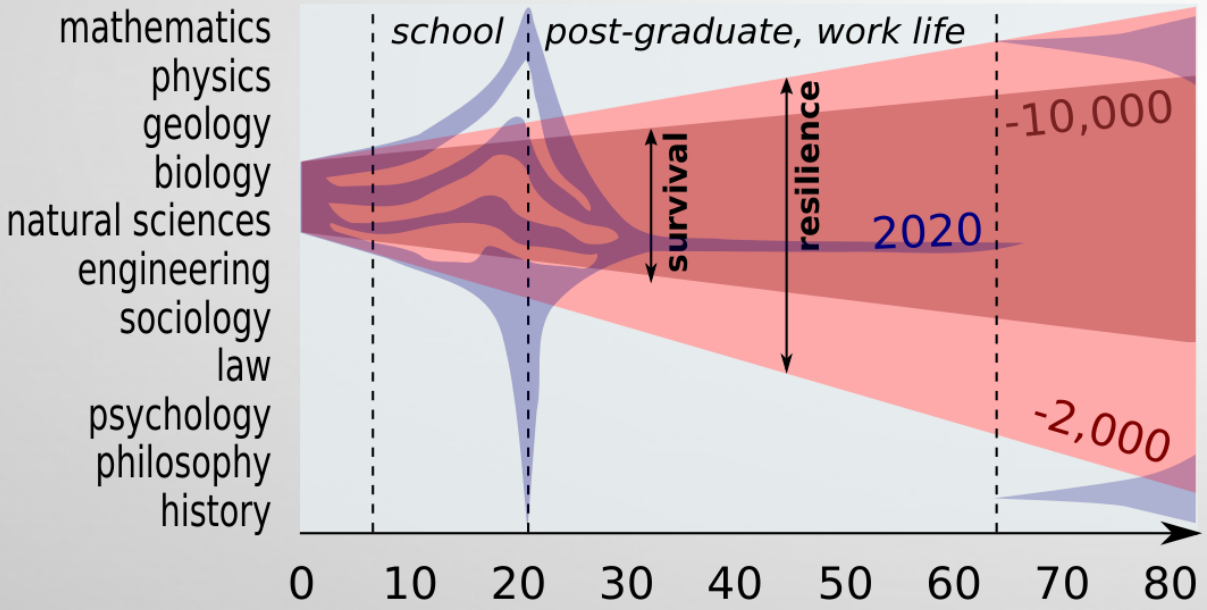
1. Increase accessible space.
2. Dependence to oil, to reachable places.
3. Expensive, deleterious to the planet.

Science, knowledge sharing, and AI

Illich, I. (1973). Tools for conviviality

Modern science and instruction

1. Provide protection, equipment, knowledge.
2. Overspecialized, ***targeting consumers***
3. Inaccessible without diplomas and to the poor.



Technologies of AI

1. Allows for fast automated decision making by machines.
2. Reduces "power of action", decision making, know-how.
3. Increases dependence to machine, oil: reduces resilience.

Radical monopoly!

AI faces planetary limits: what can we do?

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*Redefine, dimension**,***
*engage **and rebuild.***

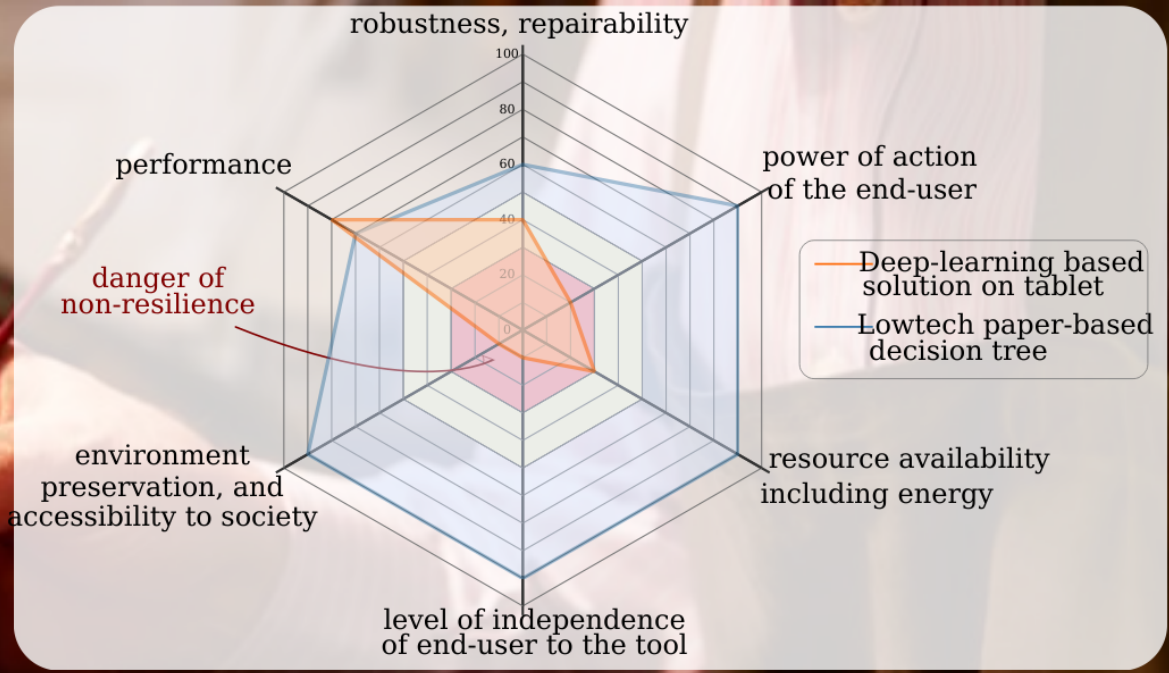
Investing in low-techs

What is a low-tech?

- Compatible with "conviviality".
- Brings back knowledge, resilience.
- Moves thermal to metabolic energy.
- Local in space and time, but shared.

Examples of low-tech

- Solar-powered low-tech website (https://solar.lowtechmagazine.com/)
- Computerless informatics & AI.
- Minimalistic digital for resilience.



Concrete example: from high-tech AI to low-tech paperboard

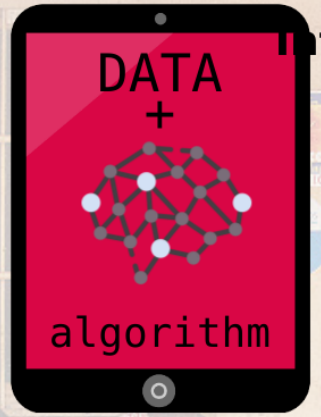
Dr d'Acremont (dispensaries in Tanzania) https://www.youtube.com/watch?v=ni-I_AXepSs

Initial position

very sick children

no qualified MD

high mortality rates

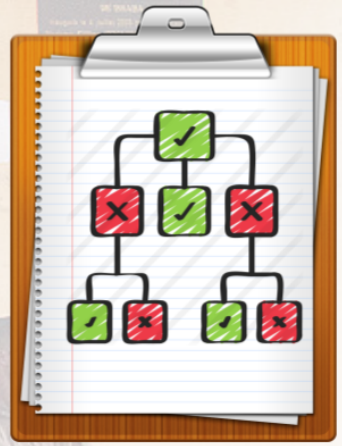


Intermediary position

✓ low mortality rate

✗ tablets:

- unusable without energy
- rare metals extracted from mines by other children



Final position

✓ low mortality rate

✓ decision tree

- usable without energy
- more intuitive, supported by algorithm interpretation

Power of action and diplomacy of interdependances

Baptiste Morizot, "Manières d'être vivant"

Spinoza's *Ethics* of happiness
→ rationality *and* desire → power of action

A geopolitics of the living
→ diplomacy of interdependances
(not a diplomacy of individual interests)
→ power of action = apprehend interdependances

ex. wolves, sheep, dogs, shepherds, soil.

Communities of importance
- who are we?
- we are our mitochondria, our body envelop, our ground, the living, life?

Build and protect
- *build* the diplomacy: it is a "practice"
- fight those who destroy it

ex. bees oppose (by their own death) threateners of life: their political power

Where does that bring us?
- Option 1. "more efficiency" → fateful illusion
- Option 2. "repair Nature" → means 'nature' is not 'us'?
- Option 3. "diplomats of interdependances"
→ think as *the living*, not as self-interested human beings.

Thank You.

*Redefine, dimension**,***
engage ***and rebuild.***