IOT and Advanced Communication Protocols for Energy Efficiency

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Today's Number of IP addresses

The IP address space is 32-bits (**2**^{32}) in size and contains

4,294,967,296

IPv4 addresses

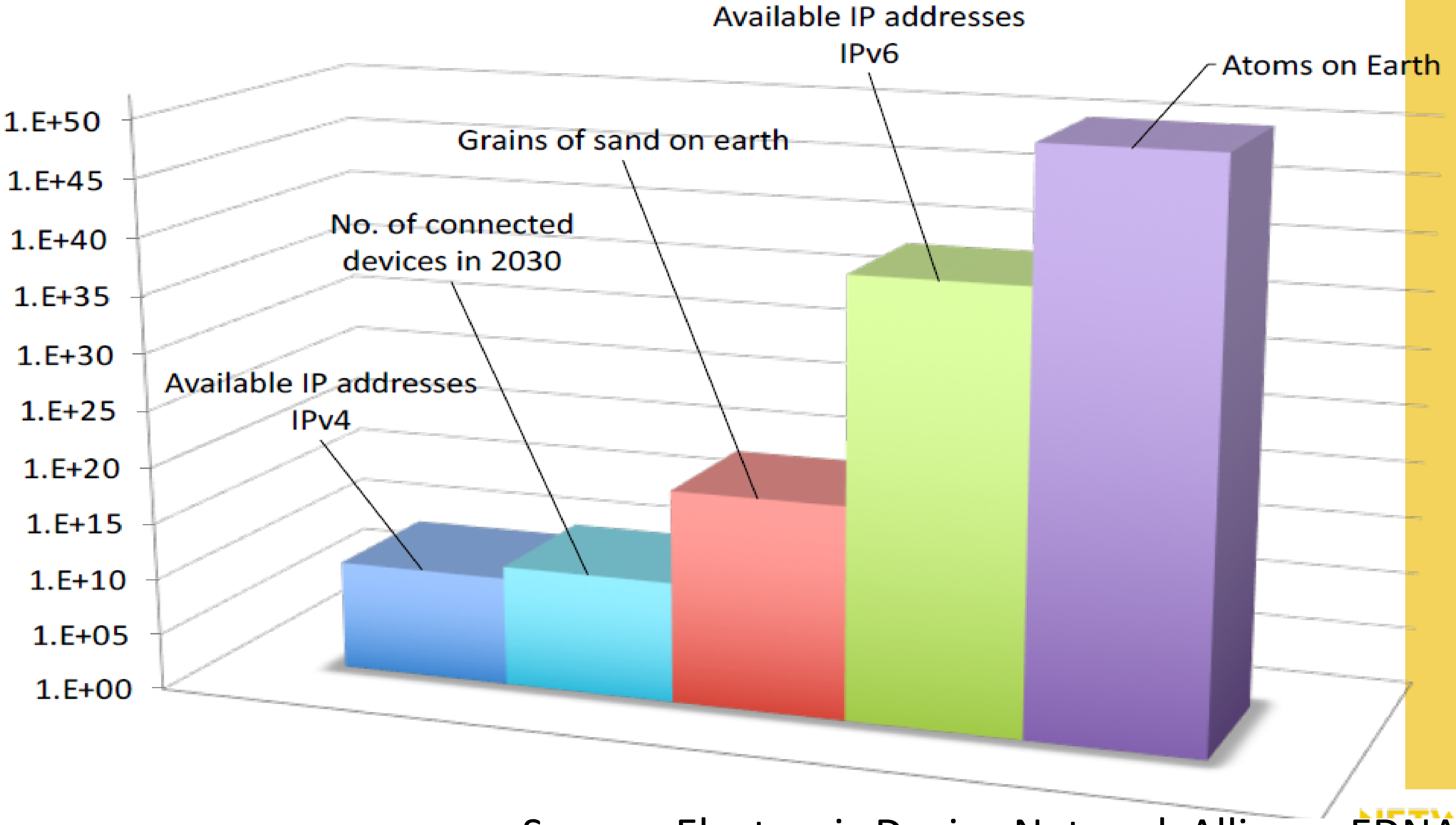
Tomorrow's Number of IP addresses

The IPv6 address space is 128-bits (**2**^{128}) in size & contains

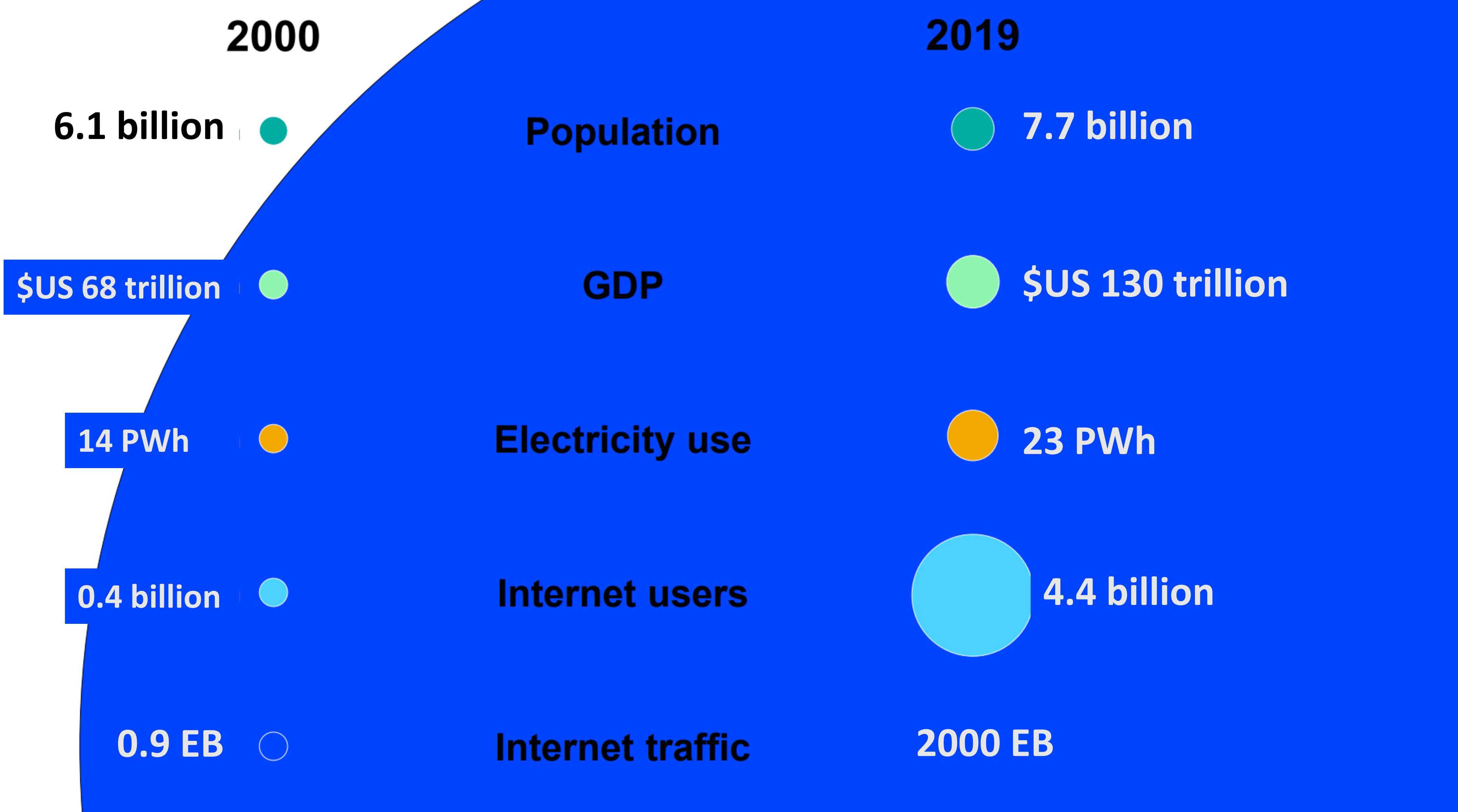
340,282,366,920,938,463,463,374,607,431,768,211,456

IPv6 addresses

Connected devices call for effective policies ...



Source: Electronic Device Network Alliance EDNA-IEA



Sources: UN (2019), World Population Prospects 2019; World Bank (2020), Data Bank: GDP, PPP (Constant 2017 International $); IEA (2020), Data and statistics; ITU (2020), Statistics; Cisco (2015), The History and Future of Internet Traffic; Cisco (2018), Cisco Visual Networking Index: Forecast and Trends, 2017–2022

Number of connected objects is multiplied by 48 in 15 years

Evolution	2010	2015	2020	2025
Users (million)	2 023	3 185	4 700	5 500
Devices (million)	13 531	18 405	19 041	20 278
IoT (million)	1 000	9 605	20 315	48 272
Devices incl. IoT (million)	14 531	28 010	39 356	68 550

Source: **GreenIT: Environmental footprint of the digital world,** October 2019,
https://www.greenit.fr/environmental-footprint-of-the-digital-world/

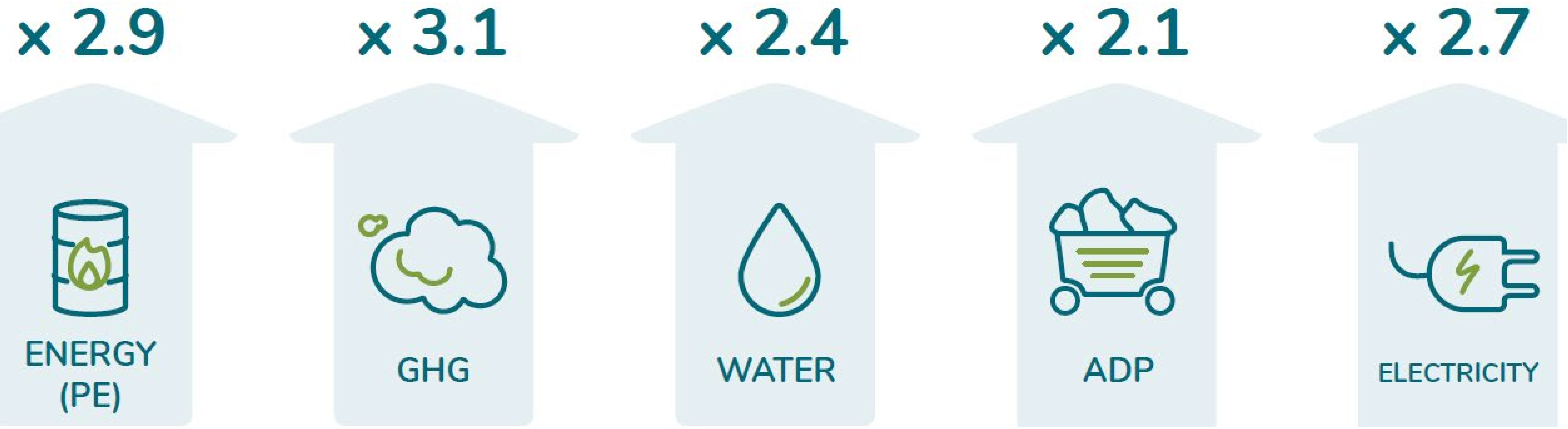
The digital world’s contribution to the GLOBAL Environmental footprint in 2019

PRIMARY ENERGY CONSUMPTION (PE):	GREENHOUSE GAS EMISSIONS (GHGs):	WATER CONSUMPTION (WATER):	ELECTRICITY CONSUMPTION (ELECTRICITY)*:
4.2 % [1]	3.8 % [2]	0.2 % [3]	5.5 % [4]

Source: **GreenIT: Environmental footprint of the digital world,** October 2019,
https://www.greenit.fr/environmental-footprint-of-the-digital-world/

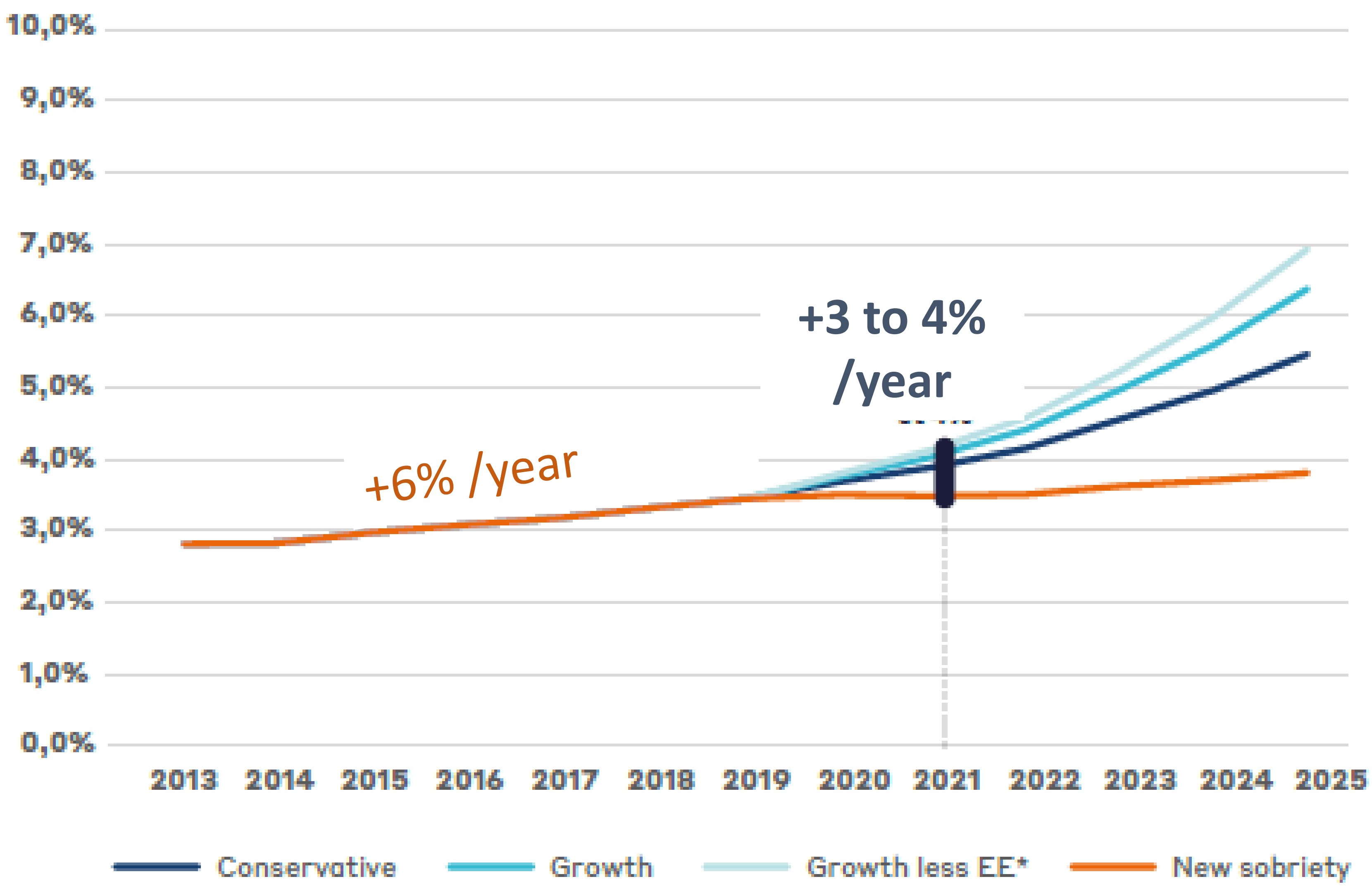
If “Digital” was a country, it would have about 2 to 3 times the footprint of France.

Possible evolution of global environmental footprint between 2010 and 2025



<u>Source:</u> **GreenIT: Environmental footprint of the digital world,** October 2019, https://www.greenit.fr/environmental-footprint-of-the-digital-world/

The share of global GHG due to ICT to double in coming years



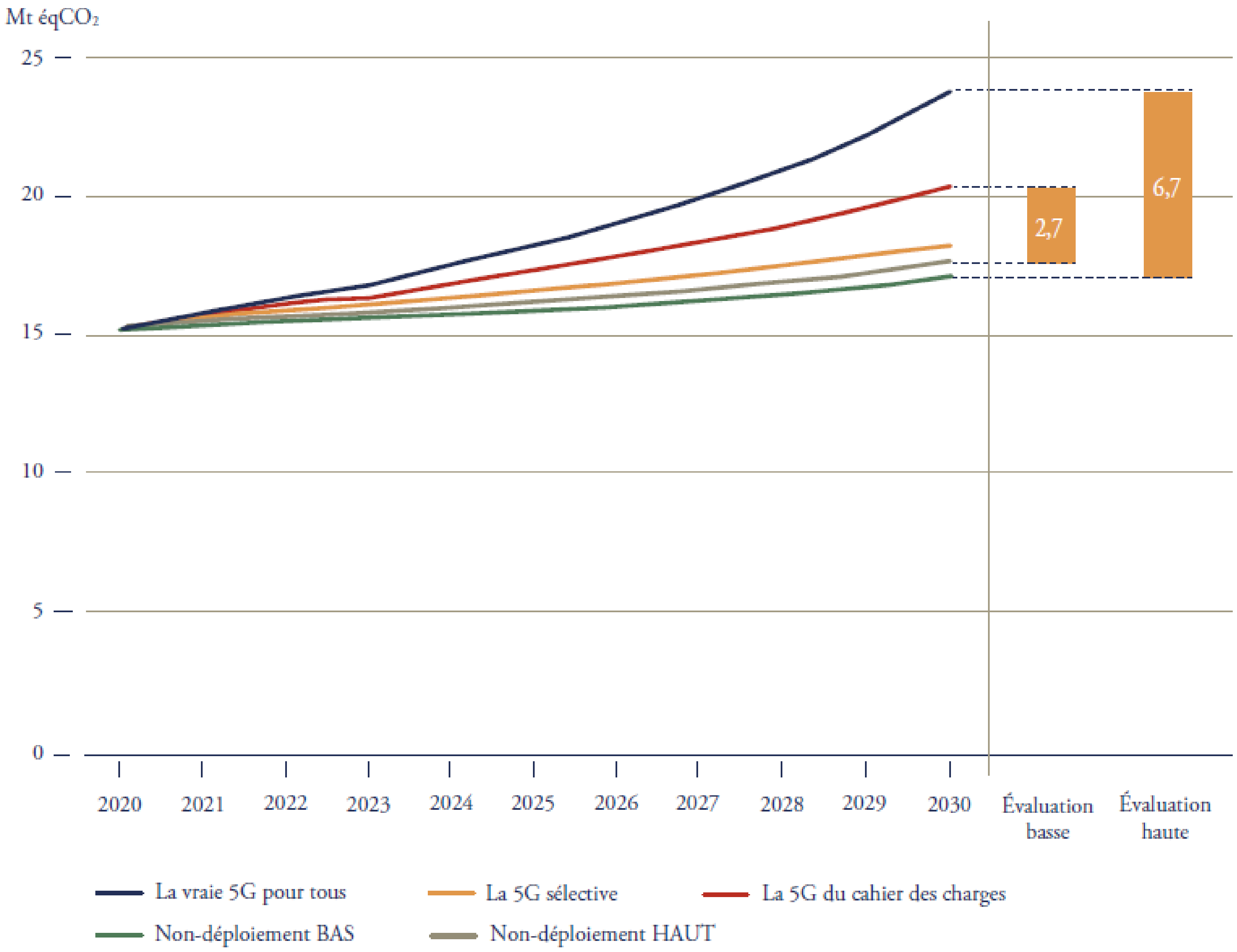
Source: The Shift Project "LEAN ICT: TOWARDS DIGITAL SOBRIETY"
https://theshiftproject.org/en/article/lean-ict-our-new-report/

Breakdown of digital world's environmental footprint in 2019

%	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%

Source: **GreenIT: Environmental footprint of the digital world,** October 2019, https://www.greenit.fr/environmental-footprint-of-the-digital-world/

In France, the deployment of 5G will increase GHG emissions and Electricity demand



Note : L'évaluation basse correspond à la différence entre le scénario « La 5G du cahier des charges » et le « Non-déploiement HAUT », tandis que l'évaluation haute correspond à la différence entre « La vraie 5G pour tous » et le « Non-déploiement Bas ».

Source: **France's High Council for Climate, January 2021**

GSMA 2021 Report:
Smart Energy Systems Connectivity for a zero-emissions future

The implementation of Smart Energy Systems will prevent an overbuild of capacity worth 16,000TWh of annual generation.

And will save emissions of 7.7 billion tons of CO2, making it responsible for over **23 per cent of global decarbonisation**.

CH4

F-Gaz

CO_2

SF6

NOx

Green House Gases

1. Lifestyle & Behavior change

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2. Energy Efficiency

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2. Energy Efficiency
3. Choice of energy

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4. Material footprint

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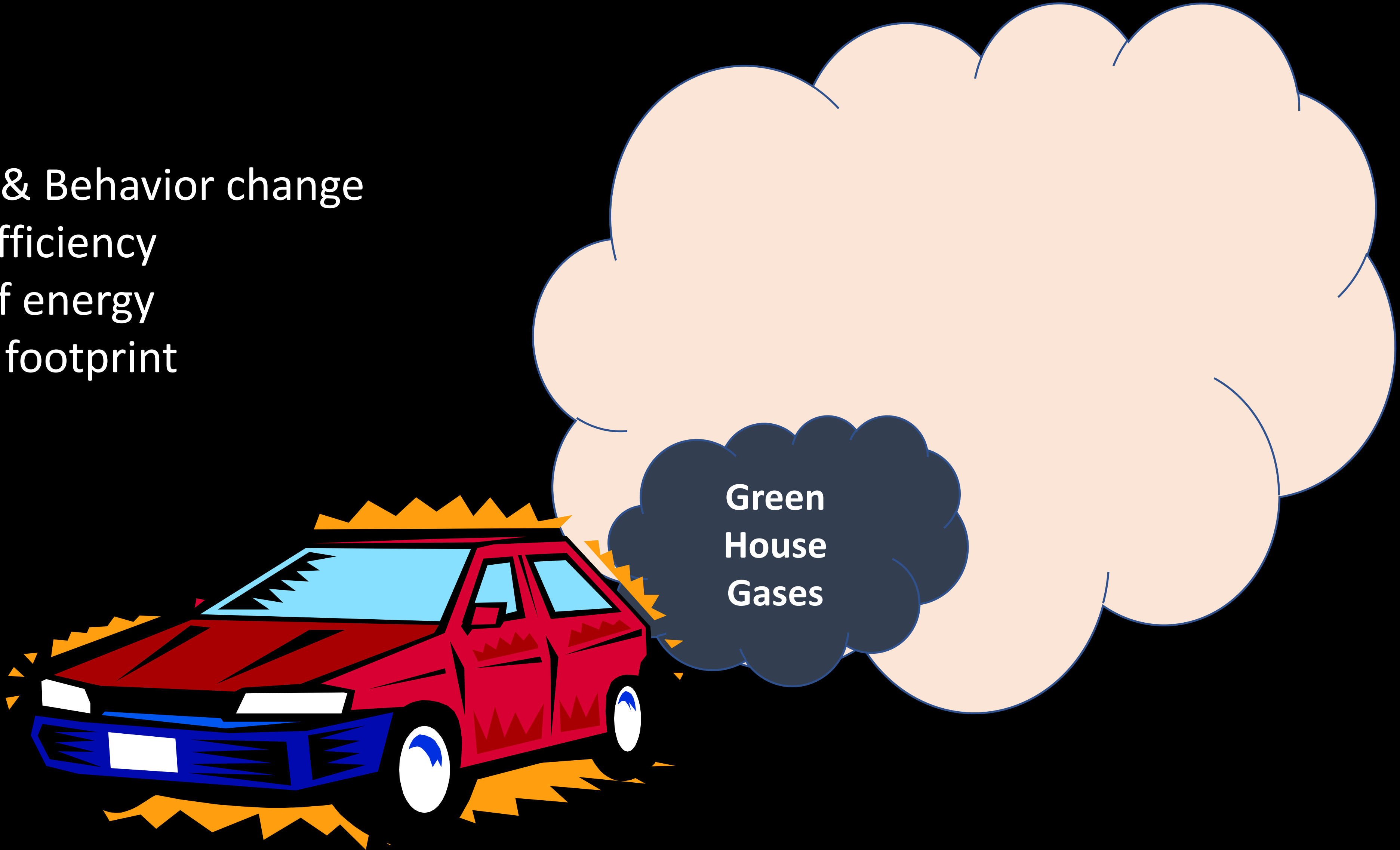

1. Lifestyle & Behavior change
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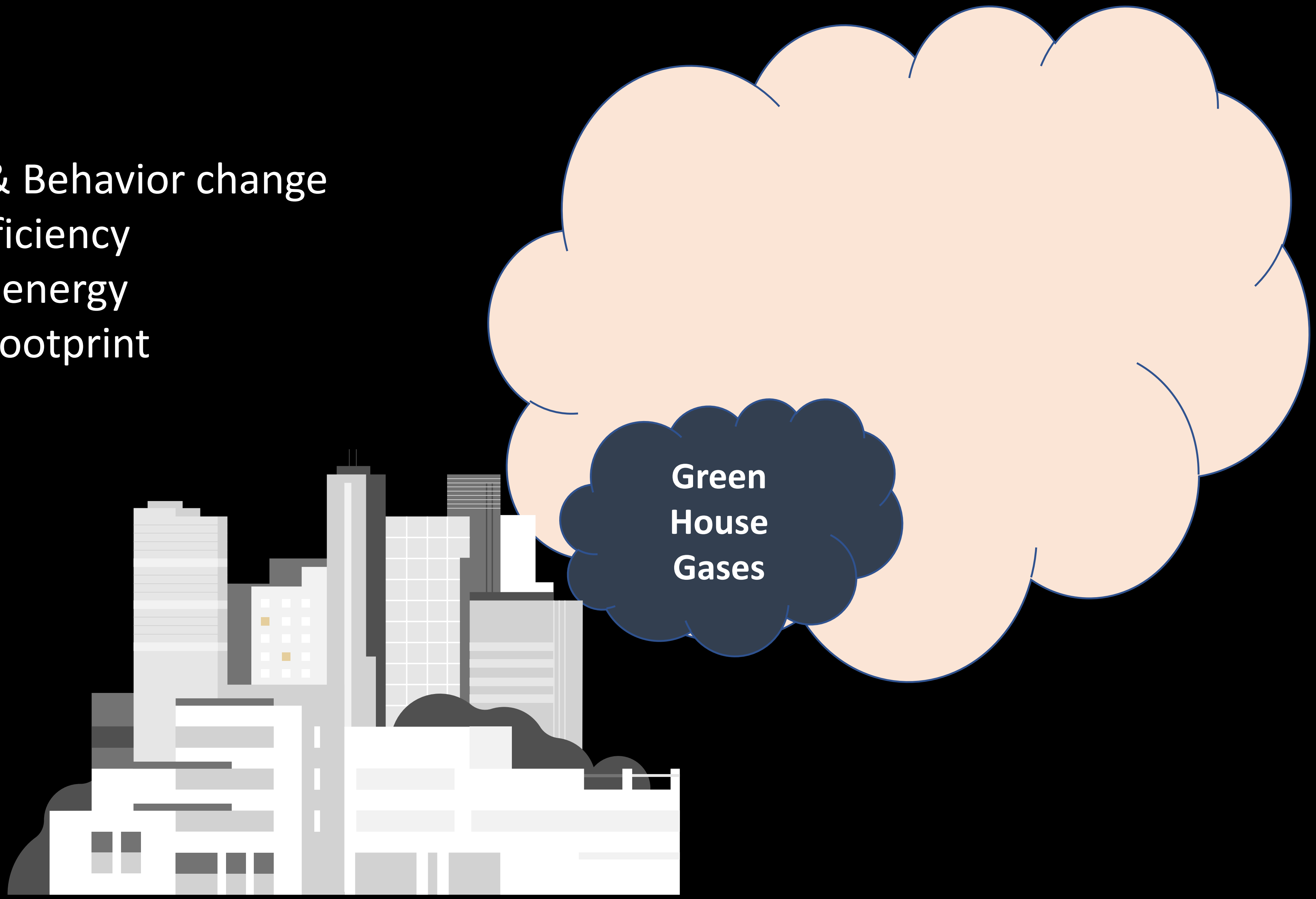
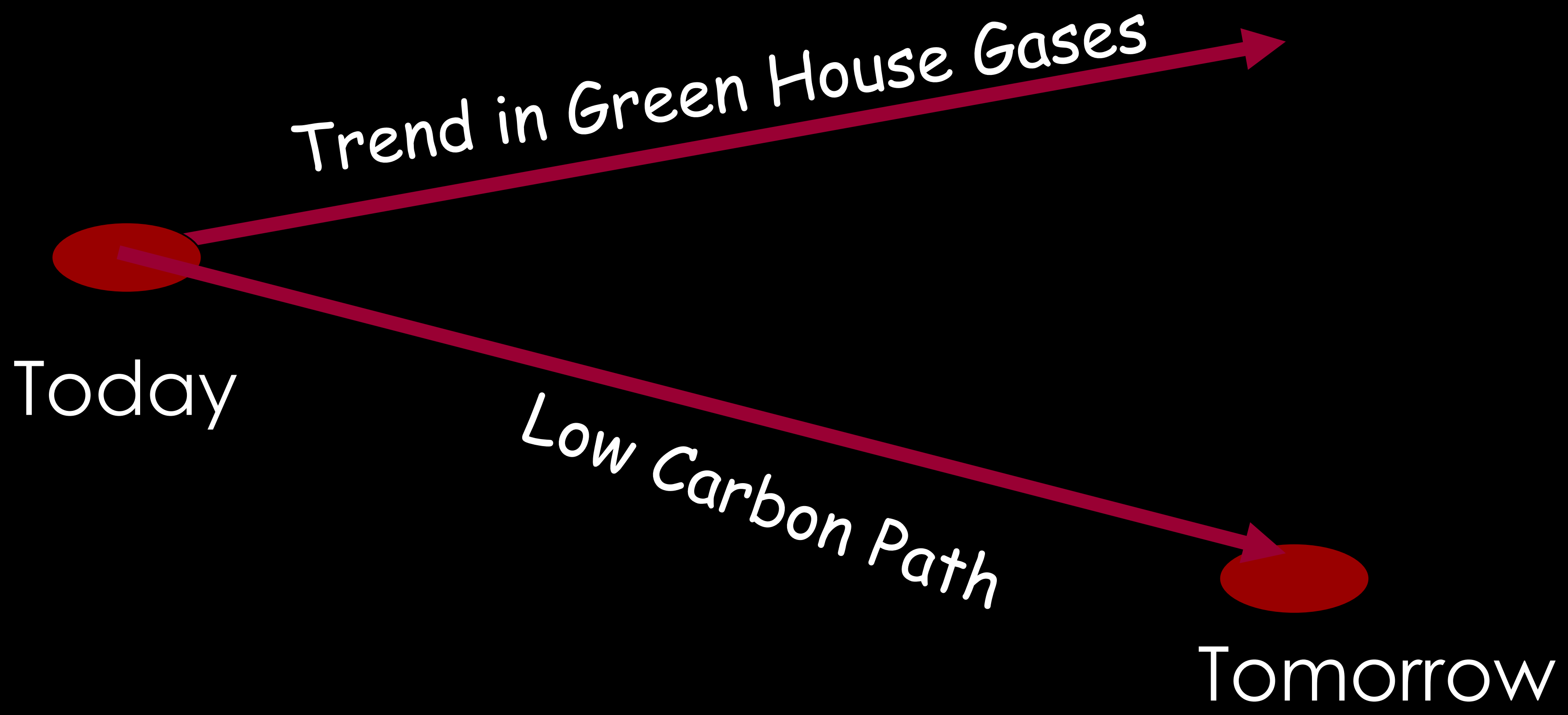
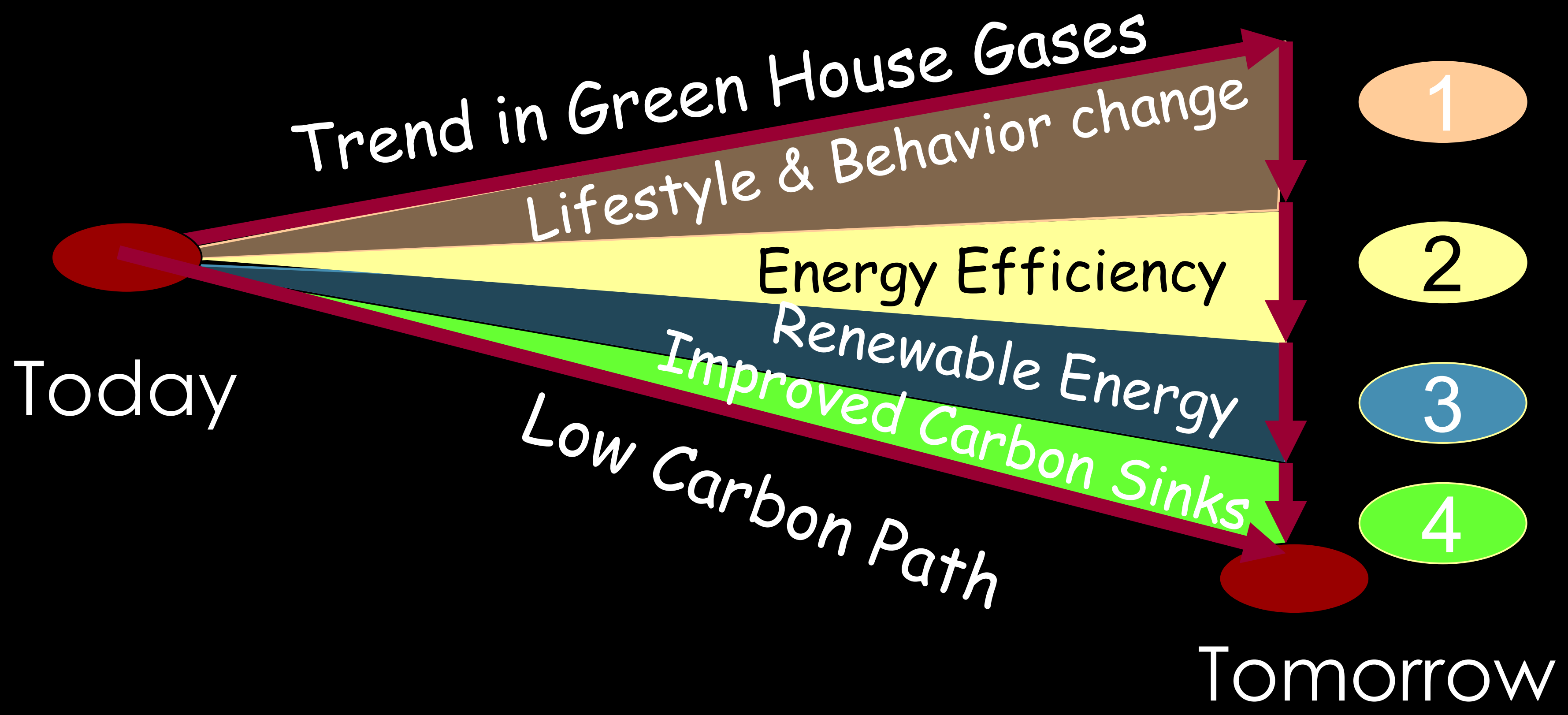
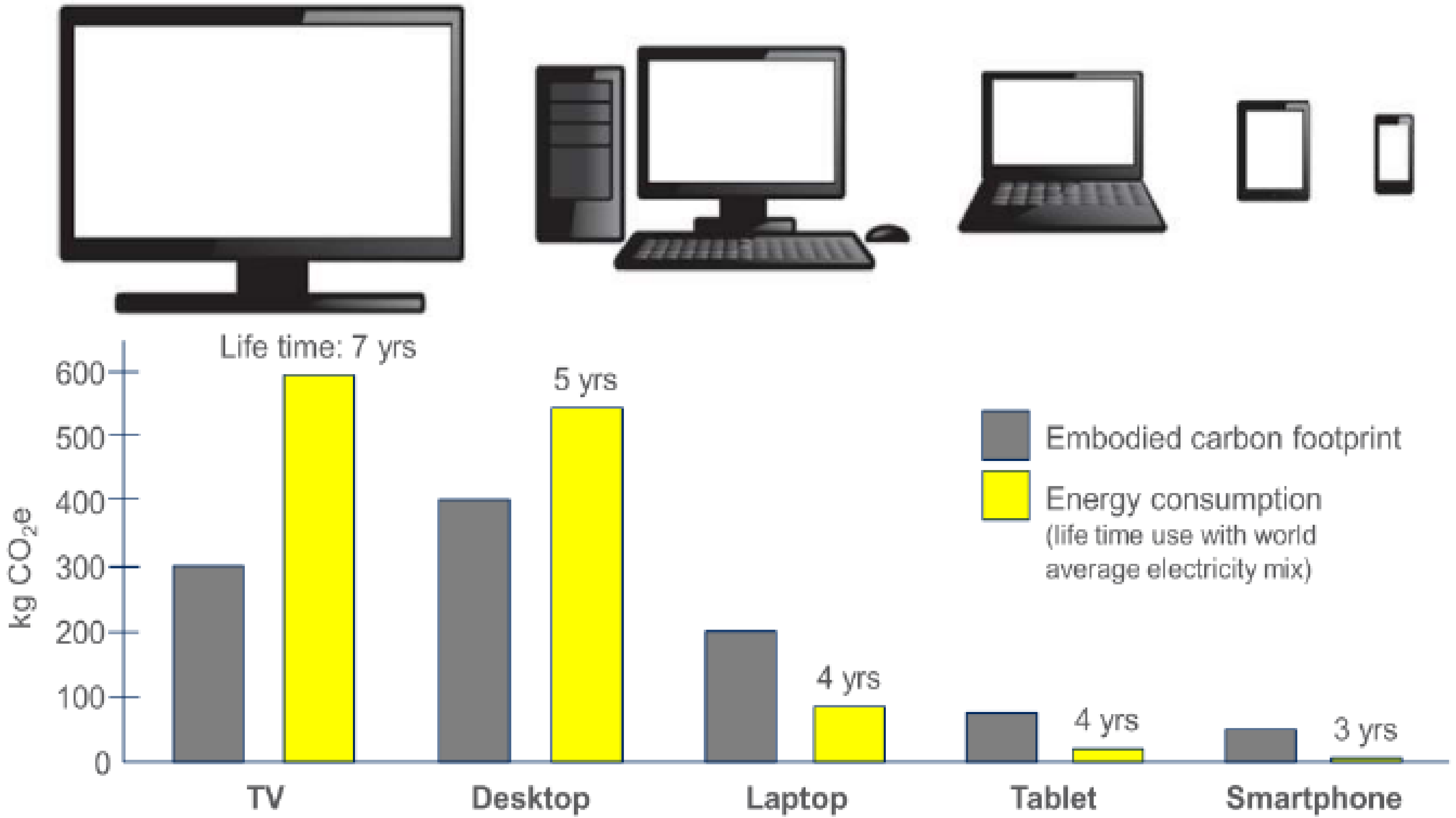


To meet the Paris Agreement we have to follow on a low carbon path



Four wedges for a low carbon development





Malmodin & Lunden (2018), The Energy and Carbon Footprint of the Global ICT and E&M Sectors 2010–2015

Digital technologies influence all sectors across all economies

- **Knowledge & Policy:** data collection; modelling; assessing policy options and effectiveness

Source: IEA 2021

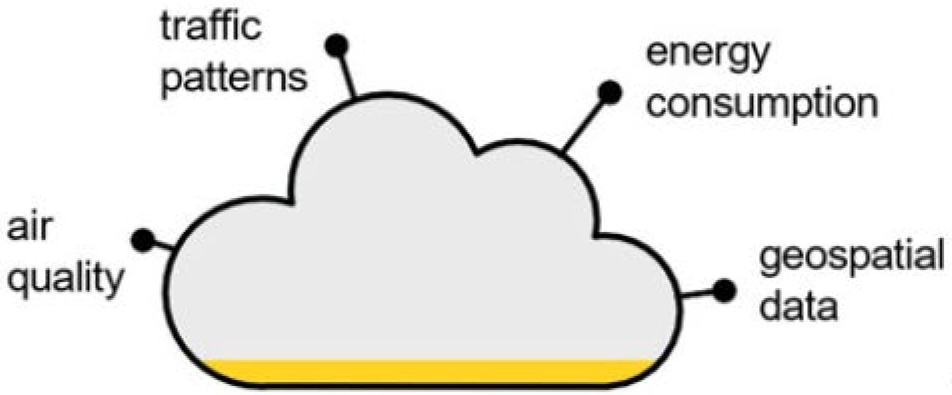
The digitalisation opportunity

Key facts

By **2021:**

83 billion

connected devices and sensors will be creating large, diverse datasets on a wide range of topics:



Only **10%** of this data is currently being analysed and put to use

Digital tools can help:

1. combine and analyse this data
2. provide information and insights
3. underpin more effective and sustainable policymaking and urban planning
4. create benefits for citizens

Digital technologies influence all sectors across all economies

- **Knowledge & Policy**
- **Buildings:** smart building controls & thermostats; connected appliances & lighting

Source: IEA 2021

Digital technologies influence all sectors across all economies

- **Knowledge & Policy**
- **Buildings:** smart building controls & thermostats; connected appliances & lighting
- **Transport:** shared mobility services; automated & connected vehicles; freight optimization
- **Industry:** robotics; 3D printing; machine learning
- **Electricity:** IoT and automation to improve efficiency and reduce maintenance costs; machine learning to improve wind & solar forecasts, and better match supply and demand from increasingly decentralized sources
- **Oil & gas:** machine learning to reduce costs of detecting methane leaks

Source: IEA 2021

Make smart ICT a chance to the Energy Transition

- Adopt digital sufficiency as a principle of action (how much do we really need?)
- Continue to study and harvest data on ICT use and its impact
- Transform data into knowledge: Inform and spread awareness
- Enhance the eco-design & increasing the lifespan of equipment
- Eco-design of digital services: Encourage resource-efficient software for video streaming, gaming, cloud computing…
- Support «Network Zero Innovation Challenge»
- Phase out 2G and 3G networks as 5G network is being deployed

Energy Efficiency is best defined in “D”

- Decouple
  - Decarbonize
    - Digitalize
      - Decentralize
        - Disruptive
          - Desirable

Conclusion

- Digital technologies have direct and indirect effects on climate change.
- The effects of digitalization on other sectors and activities are potentially much larger than its direct footprint, but these effects are complex and difficult to quantify.
- Strong climate policies are needed to ensure digital technologies are applied to reduce emissions (and not increase them)
- The fast deployment of ICT imposes that we redouble efforts to promote energy efficiency in every sector
- Encouraging resource efficient ICT is possible, but forces us to redefine the type, the pace and the way we address policy intervention.
- International collaboration can help countries save cost and time to encourage more resource efficient ICT

Thank you for your attention !

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