



COPENHAGEN CENTRE  
ON ENERGY EFFICIENCY  
SEforALL EE HUB



ITU Side Event -  
Unlocking the potential of digital technologies for a sustainable energy transition

# Sustainable Energy Transition through Energy Efficient Data Centres

**Xiao Wang 王潇**

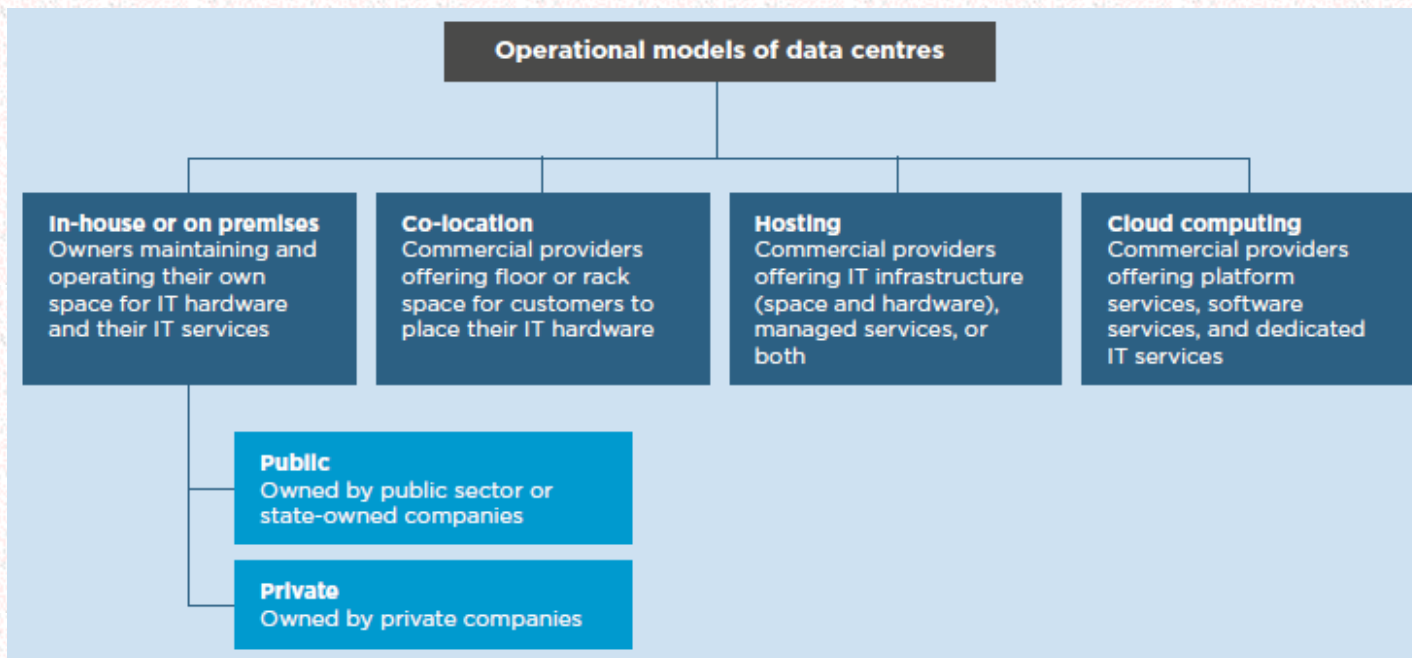
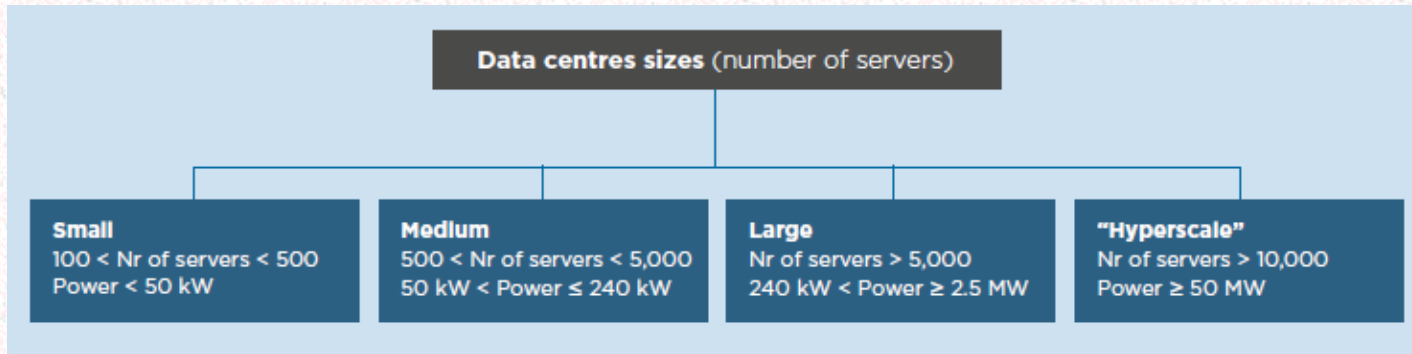
**UNEP DTU Partnership, Copenhagen Centre on Energy Efficiency**

**6th July 2021**

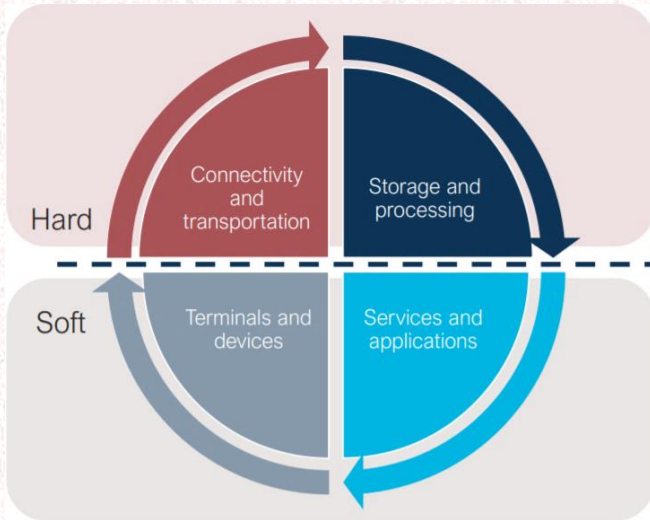
**Vienna Energy Forum**

## **Content**

- Introduction to data centre**
- Data centre - the power house of digital technologies**
- Energy and environmental impacts of data centres**
- Energy efficiency strategies**
- Environmental efficiency solutions**



A data centre is a dedicated building, which houses the technology for data processing, data storage and data communication of one or more organizations.



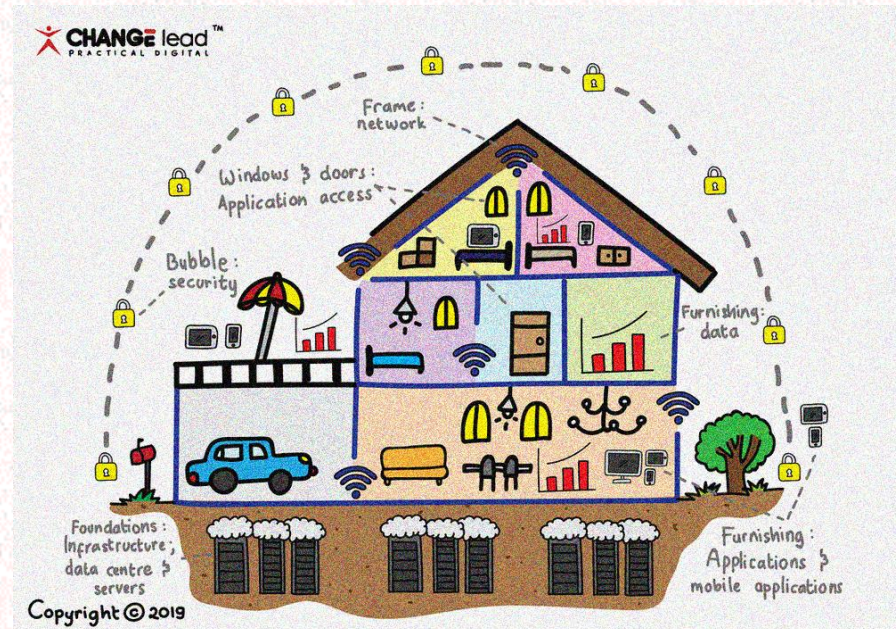
Digital Infrastructure is an integrated system including 2 categories:

(hard) physical and (soft) non-physical

It is the foundation of the digital economy.

Digital Infrastructure is no longer limited to hard physical assets, structures, and facilities. It extends to the architecture that connects it and to the technological applications to operate it.

We need connectivity infrastructure and datacenter infrastructure to support locally-deployed digital services and the growth of a local digital ecosystem.



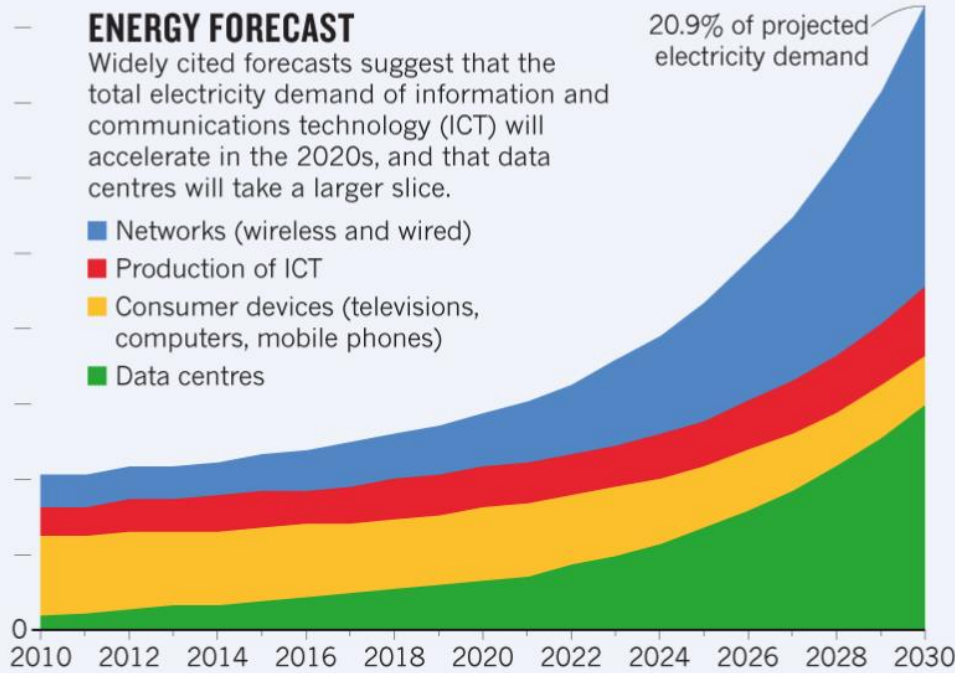
9,000 terawatt hours (TWh)

### ENERGY FORECAST

Widely cited forecasts suggest that the total electricity demand of information and communications technology (ICT) will accelerate in the 2020s, and that data centres will take a larger slice.

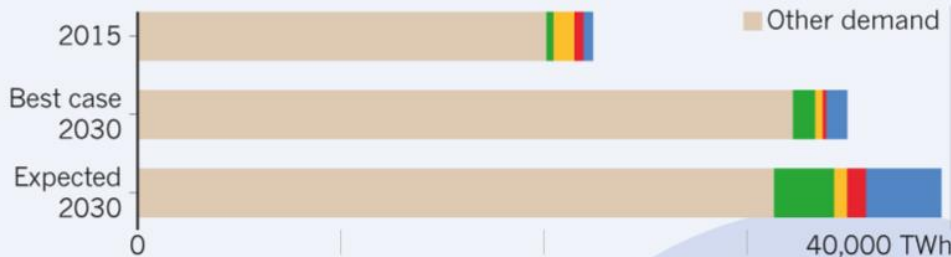
- Networks (wireless and wired)
- Production of ICT
- Consumer devices (televisions, computers, mobile phones)
- Data centres

20.9% of projected electricity demand



The chart above is an 'expected case' projection from Anders Andrae, a specialist in sustainable ICT. In his 'best case' scenario, ICT grows to only 8% of total electricity demand by 2030, rather than to 21%.

### Global electricity demand



### ENERGY SCALE

Global electricity demand

20,000 TWh

Electricity use by ICT

2,000 TWh

Data-centre electricity demand

200 TWh

Bitcoin use by mid-2018

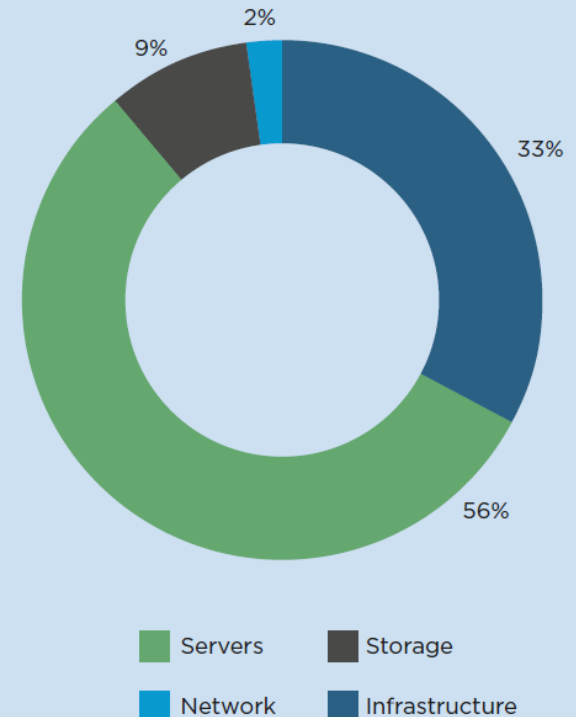
20 TWh

©nature

Figures are approximate.

Sources: IEA/A. Andrae/Ref. 6

**Figure 3. Share of energy demand by different components in data centres globally (2020). Elaborated with data from International Energy Agency<sup>vi</sup>**



### Environmental Impact Analysis (EIA)

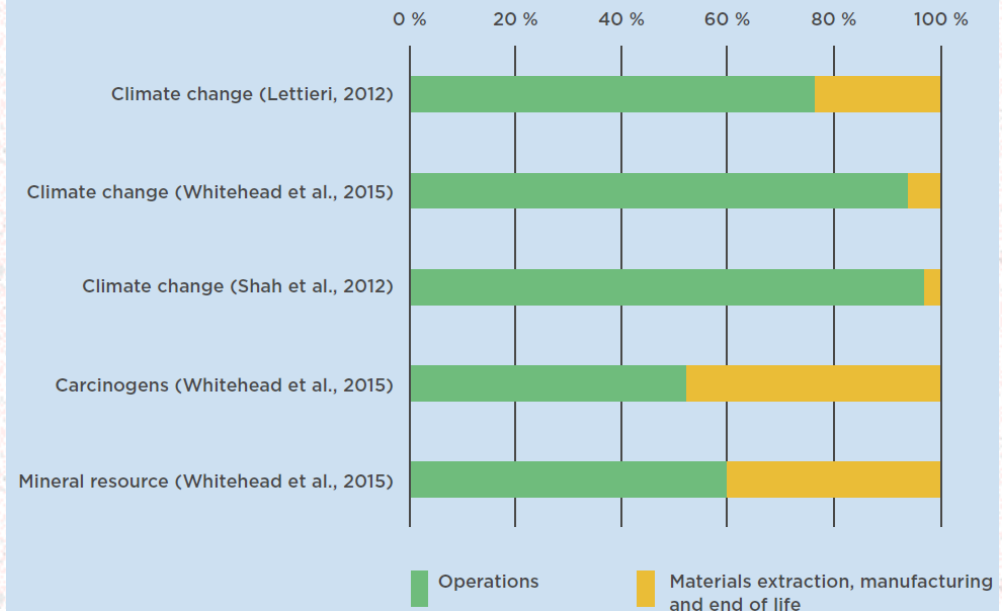


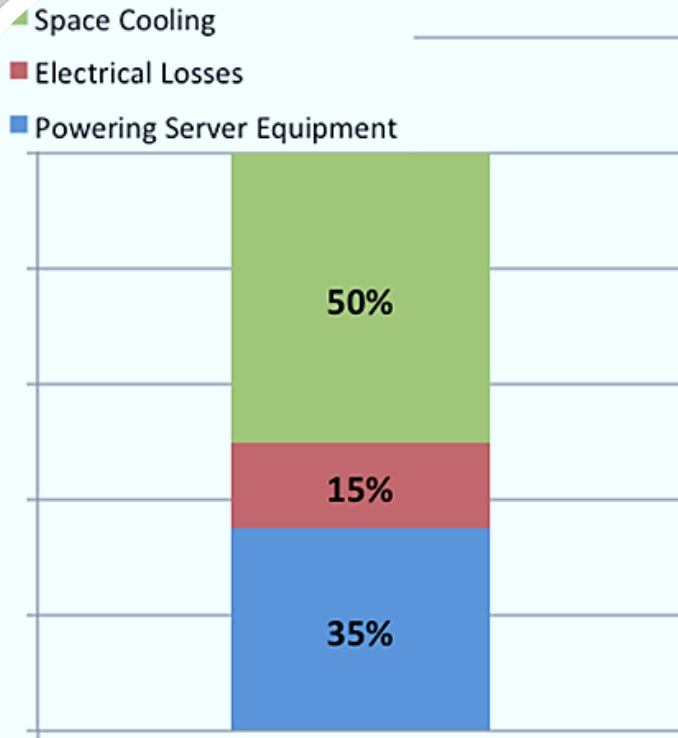
Source: rlb.com

An estimated 20 to 50 million metric tonnes of E-Waste is disposed of globally every year depositing heavy metals and other hazardous waste into our landfills. If measures are not taken E-Waste is expected to grow 8% each year.

The inclusion of the entire life cycle of data centres is essential to prevent environmental burden-shifting from one life cycle stage of the system to another or from one component to another.

Life cycle contributions to selected environmental impacts associated with data centres.





Typical Data Center

### Efficiency Strategies

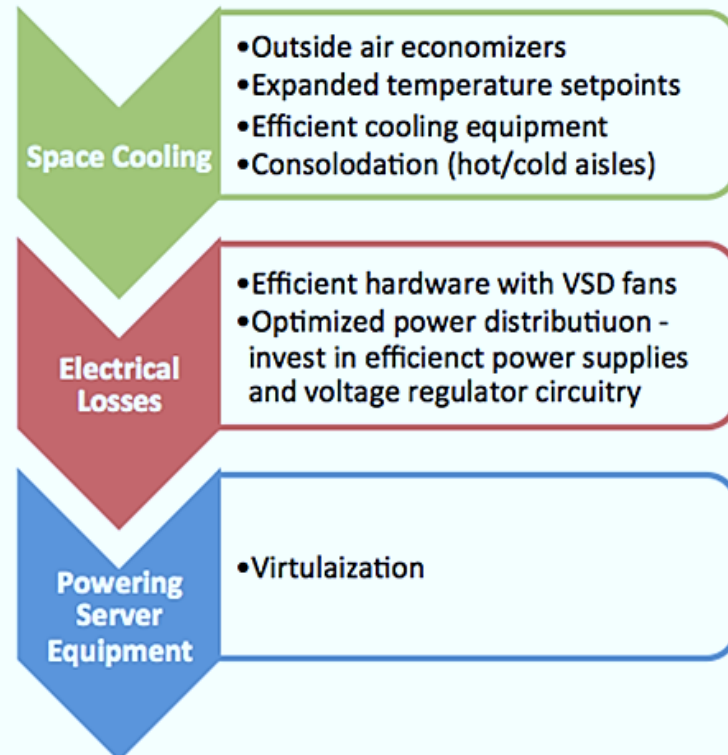


Figure 2: Energy Use Breakdown and Efficiency Stratgeies for Data Centers

# THE GREEN DEAL NEEDS GREEN INFRASTRUCTURE



WE REUSE AND REPAIR SERVERS



WE PROVE ENERGY EFFICIENCY  
WITH MEASURABLE TARGETS



2020

Signing of the  
Climate Neutral  
Datacenter Pact.

2025

First milestones  
of the pact.



2030

Climate Neutral  
datacenters.



WE PURCHASE 100% CARBON-FREE ENERGY



Cloud computing is the technological force for change behind the European Green Deal & Digital Strategy. Cloud infrastructure providers & data center operators created a self-regulatory initiative for data centers to be climate neutral by 2030.



WE PRIORITISE WATER CONSERVATION



# Thank you!

**DATA CENTRE BRIEF SERIES FEBRUARY 2020**

**BRIEF 1 Environmental sustainability of data centres: A need for a multi-impact and life cycle approach**

**KEY MESSAGES**

- The concerns over energy use of data centres and associated impacts on climate change have aimed efforts to reduce data centres' energy demand during operations.
- The focus on reducing climate change related impacts arising from data centres' operations can overlook relevant environmental impacts from other life cycle stages, including raw material extraction, equipment manufacturing, data centre construction, end of life of equipment and data centre buildings.
- To support the design of truly sustainable data centres, more comprehensive environmental sustainability assessments, encompassing the entire life cycle and factoring in a broad spectrum of environmental problems, are needed.
- This issue brief uses examples to showcase the substantial environmental impacts of data centres accounting for other life cycle stages, data centre operations and calls for the use of Life Cycle Assessment (LCA) to assess and address such impacts.

**DATA CENTRE BRIEF SERIES JULY 2020**

**BRIEF 2 Data Centres: Digitalisation Powerhouse and Energy Efficiency Potential**

**KEY MESSAGES**

- The digitalisation of the economy worldwide and technological innovations such as artificial intelligence (AI), internet-of-things (IoT) and blockchain are driving exponential growth in the demand for data centres' services.
- Data centres use approximately 200 TWh of electricity annually, corresponding to roughly 1% of global electricity demand.
- To match the rapid growth in the energy use of data centres' services will be met by energy-efficient data centres and that their uptake of renewable energy is accelerated.
- Policy makers should establish robust mechanisms to collect data and publish statistics on the energy use of data centres, similarly to what has been done for other energy-intensive sectors.

**DATA CENTRE BRIEF SERIES SEPTEMBER 2020**

**BRIEF 3 Reducing the energy use of video gaming: energy efficiency and gamification**

**KEY MESSAGES**

- Video gaming is an increasingly popular leisure activity worldwide, but it has environmental impacts due to the energy used driving climate change and resource losses over the entire life cycle of the gaming devices.
- Among these, equipment in households, gaming devices are gradually becoming more relevant in terms of their overall energy use.
- Playing video games on server generation game consoles uses significantly less energy than playing on computers, when the unit energy consumption of the equipment is considered.
- Playing video games in the cloud, known as cloud gaming, can draw as much as a three-fold increase in energy use compared to local gaming.
- The energy used in gaming should be integrated into end-use energy demand forecasts and routinely updated with demographic data and technology preferences, which can change quickly.
- Improved consumer information and the quantification of energy information are recommended strategies that can have a direct effect on behaviour change.

**DATA CENTRE BRIEF SERIES JANUARY 2021**

**BRIEF 4 Innovative Data-Centre Cooling Technologies in China - Liquid Cooling Solution**

**KEY MESSAGES**

- The increased need to dissipate heat caused by the increased power consumption of IT equipment in data centres calls for energy-efficient cooling solutions. Liquid cooling, with its efficient heat transfer and high energy-saving characteristics, is becoming popular in China and is now building with successful business cases already on the market.
- Liquid cooling still faces many challenges in the development process. There is an urgent need to promote the development of technology and industry by strengthening industry guidance, standardising the evaluation system, and improving the industrial ecosystem, among other measures.
- This brief showcases the Alibaba and Tencent data centres' advanced liquid-cooling systems. Of the top leading Chinese internet companies, Alibaba has achieved large-scale deployment of liquid cooling technology.

**Digital Climate Emergency Series**

**Zero Carbon Emissions in Digitalization**

03 March 2020

DANISH DATA CENTER INDUSTRY

**Digital Climate Emergency Series**

**Beyond Energy Efficiency - Life Cycle Based Data Centre Sustainability**

02 July 2020

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