

Toward to “Lighting 4.0” era: The “Right Smart Lighting” Challenge

Prof. Georges Zissis

SMIEEE, Univ. Toulouse III (France)



IEEE Summit on Communications Futures
16 & 17 January 2021

IEEE Industry
Engagement
Committee



Today, artificial light is everywhere

Multiples Usages:

Monument Lighting

Street Lighting

Indoor Lighting

Signage & displays

Vehicles & transport

Non-lighting Applications



Toulouse by night

Multiples Functions:

▶ See & be seen

▶ Locate

▶ Identify

▶ Make secure

▶ Make feel secure

▶ Communicate

▶ Appreciate

▶ Enhance & fancy

▶ Create ambiance

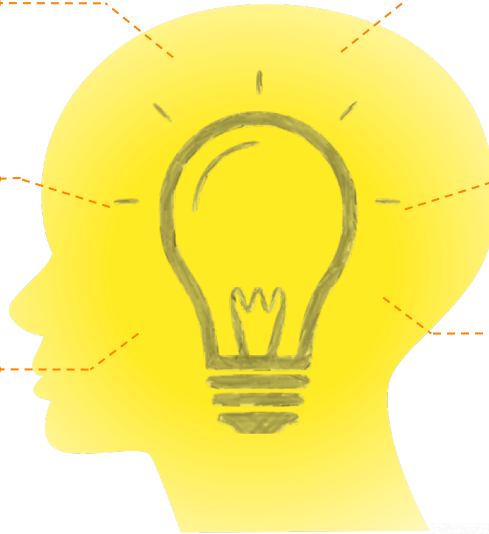


Some global figures

16,5%
2 900 TWh of annual electricity world-production for generating artificial light

~2%
2% of world annual energy primary resources used

1 150 000 000 metric tons CO₂
5% of the world CO₂ annual emissions = 230 million people CO₂ emissions

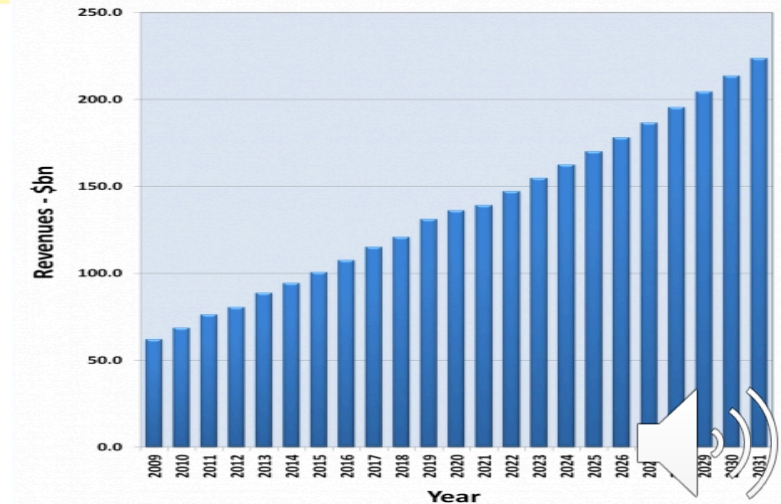


30 000 000 000
More than 30 billion electric lamps operate everyday worldwide

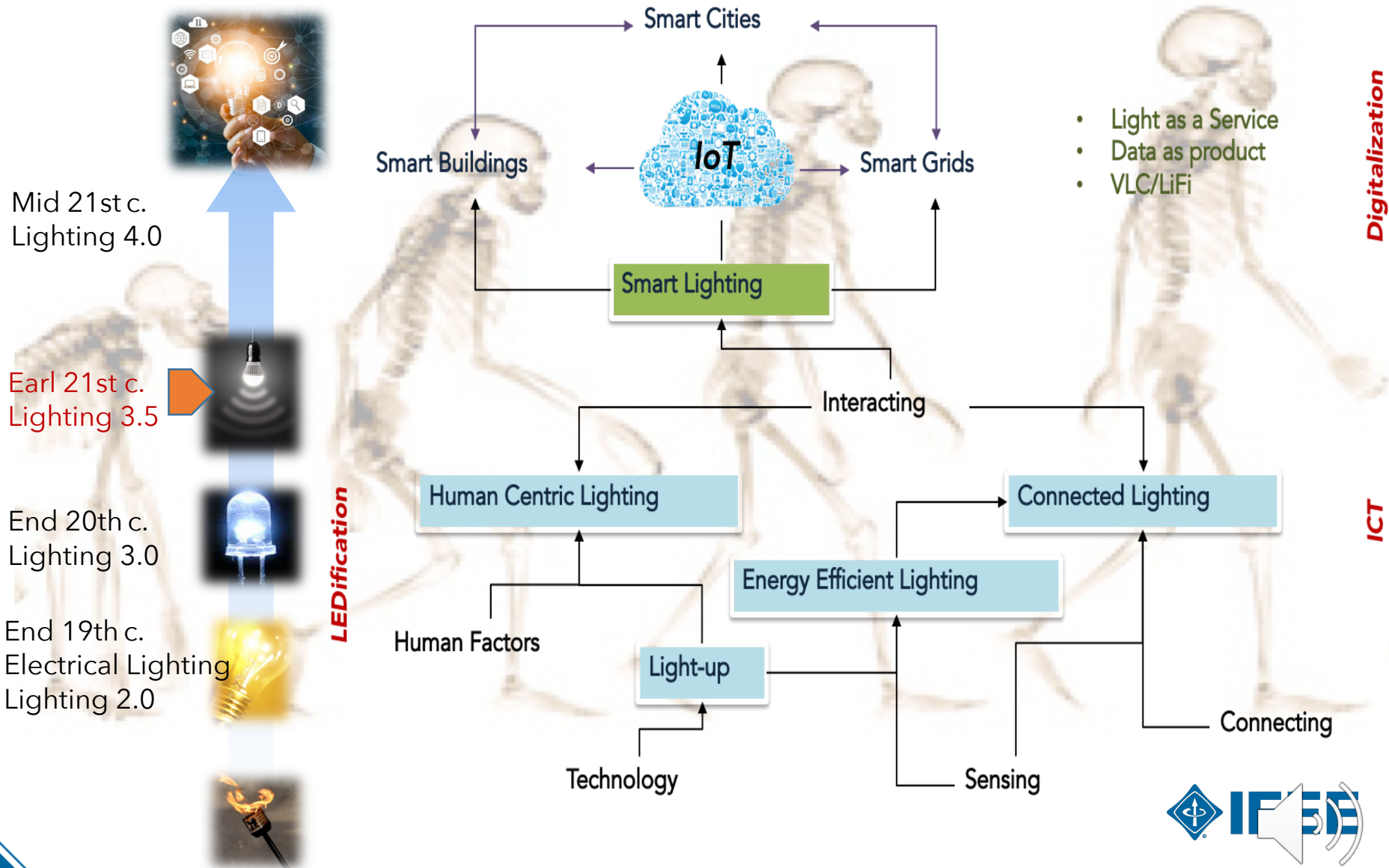
40-45%
LED market revenue share

\$120 000 000 000
Lighting industry annual turnover US\$ 120 billion and still growing.

Artificial lighting has a large impact on energy, environment but also on every day's life and world's economy



The way forward to Lighting 4.0 era

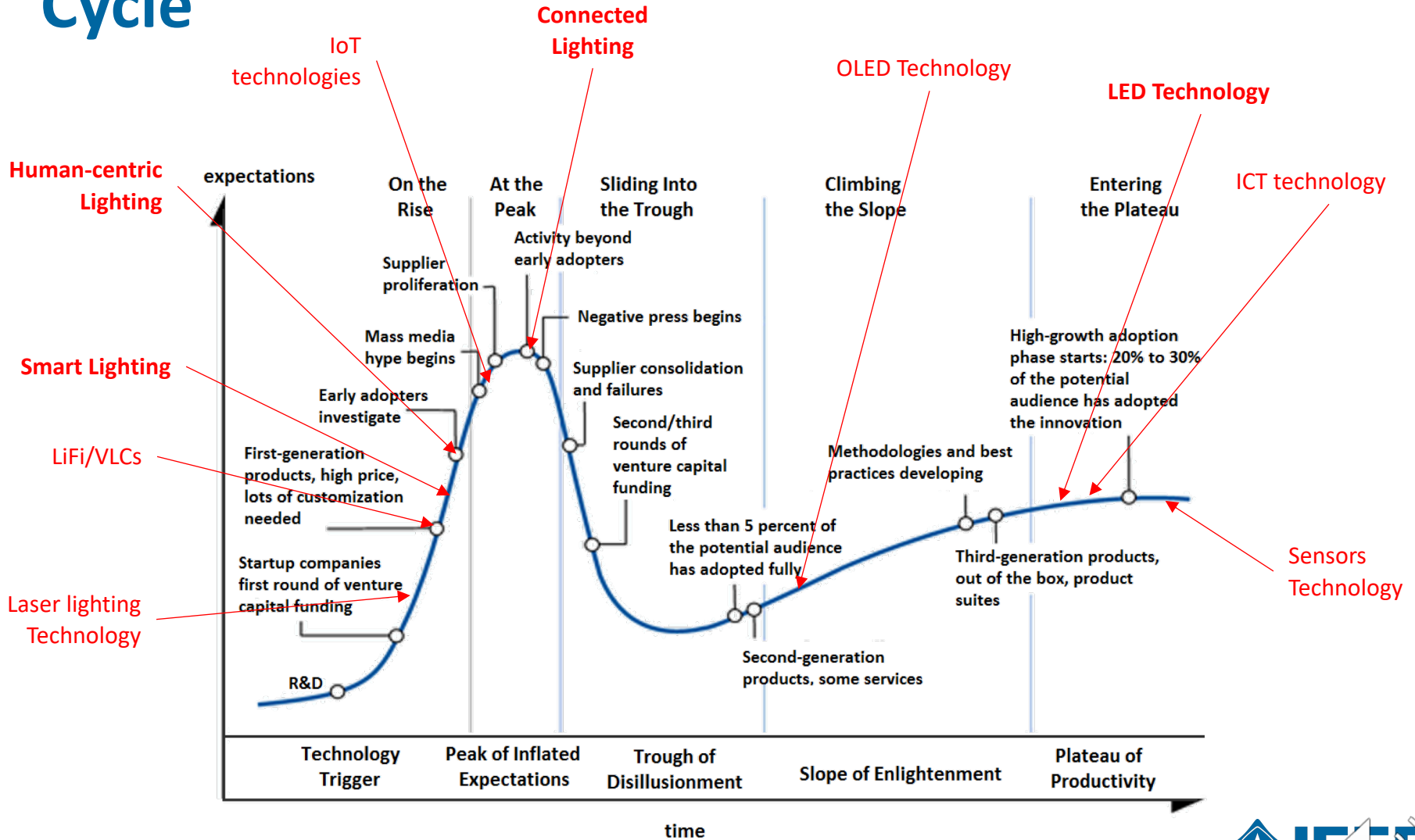


Transformative characteristics of smart lighting

- ▶ Human-centric Smart Lighting systems in buildings can produce the “right light” in quality and quantity when and where it is needed, reducing that way useless energy consumption and providing the best lighting conditions for high visual performance and high comfort for the end-user adapted to a task.
- ▶ A connected lighting system can be used as basis for connecting communicating objects thanks to visual light communication (VLC) and LiFi functionalities. Objects can communicate between them or/and a central system. VLC/LiFi offer a large bandwidth to allow large data flows. A lighting network forms a dense mesh that can be used for various applications & services
- ▶ Illumination will become a sub-function of a more complex ICT (Information Communication Technology) system, which will be a sub-system in the Internet-of-Things (IoT) global system. Light will be the vector of new services and carrier of dataflows that will spawn additional products
- ▶ In smart cities, so-called smart urban objects can be used in public areas to increase the sense of security of people. Safety in everyday life is improved by overcoming barriers such as dark areas at night without being in obligation to squander energy for illuminating empty spaces. For instance elder people, which can enhance their participation in public life. Connected smart lighting poles can recognize social alarms, hazardous situations, accidents and broadcast information to vulnerable public space users (i.e. elder or disable people).



Smart Lighting Technology status - the Hype Cycle



The ultimate solution: the “right human-centric smart lighting” concept

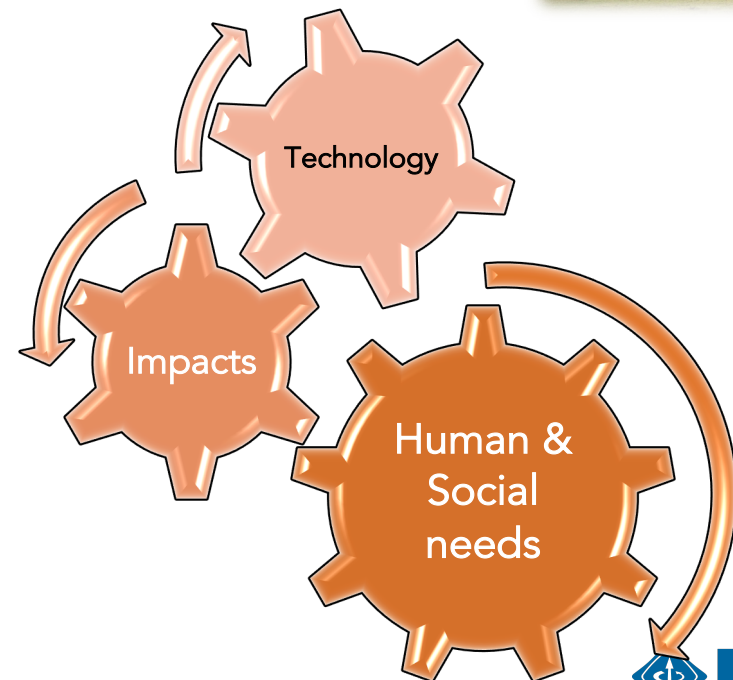
Illuminate" doesn't mean "flood" objects, people or buildings with light!

- ▶ Light-up smart, where it is needed, when it is necessary and as best as possible!



Smart Lighting development contributes to several grand challenges

- ▶ Contribute to Energy savings
- ▶ Contribute to Lighting and IT industry rise
- ▶ Contribute to Healthy working environments and high task performance
- ▶ Contribute to the Silver Economy



Thank you!

