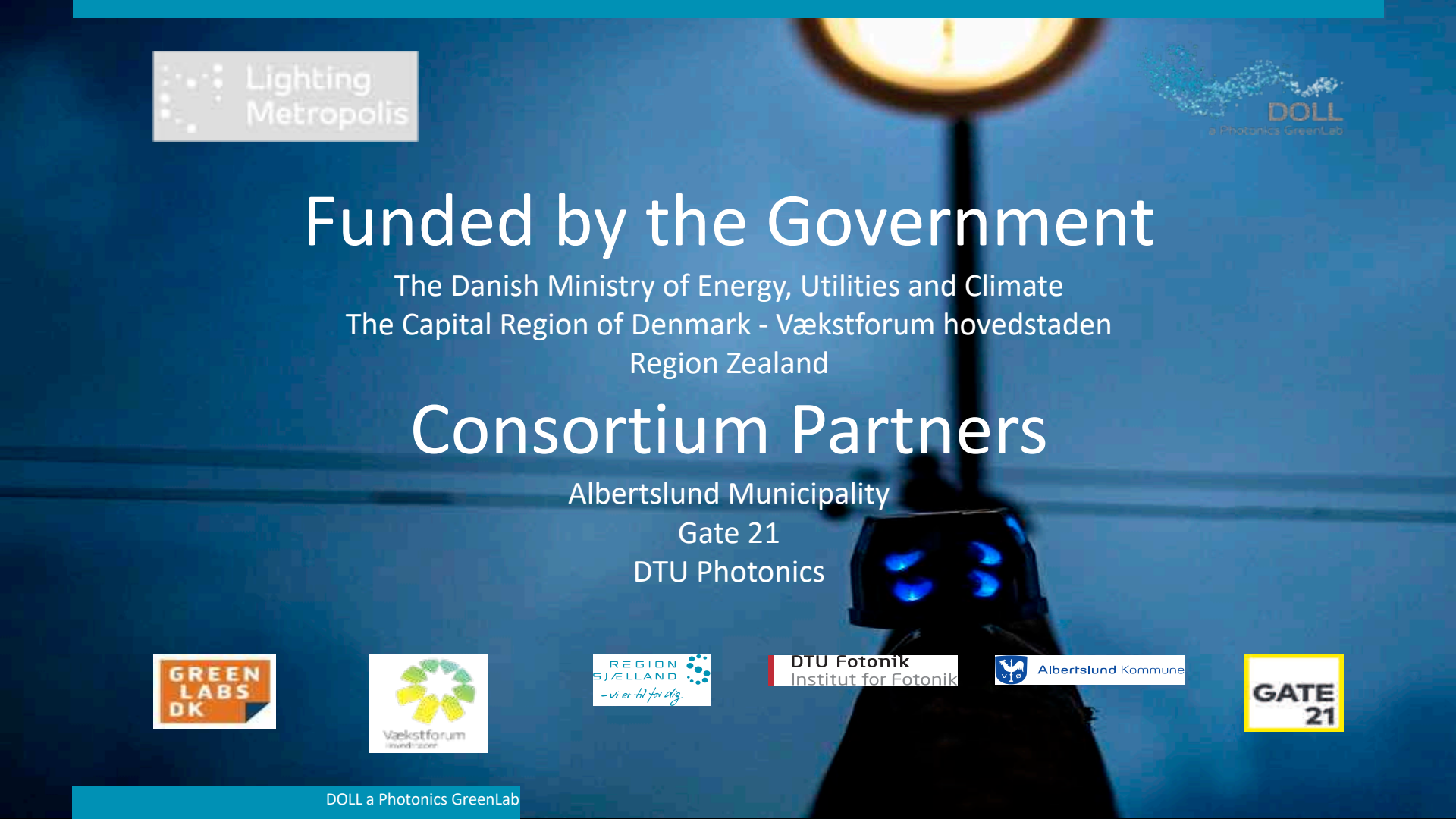
Lighting Up the Future of Smart Cities



Funded by the Government

The Danish Ministry of Energy, Utilities and Climate
The Capital Region of Denmark - Vækstforum hovedstaden
Region Zealand

Consortium Partners

Albertslund Municipality
Gate 21
DTU Photonics

Greater Copenhagen

42 Municipalities

5 Universities

+40 Companies & Utility providers

GOLD

Cluster Management Excellence

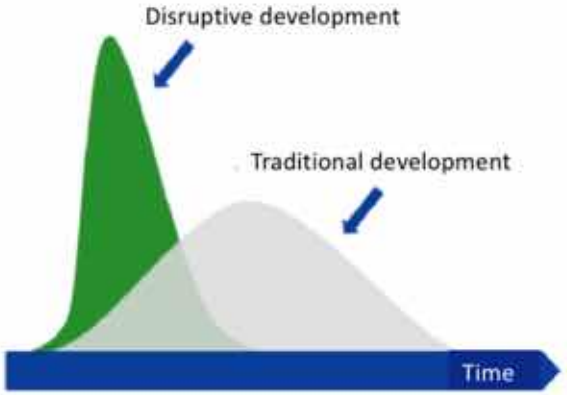
PROVEN FOR CLUSTER EXCELLENCE

Digitalization a new Basic Conditions

ERHVERVS- OG VÆKSTMINISTERIET

Digitalization a new Basic Conditions

- Short product life time
  Disruptive vs. traditional development



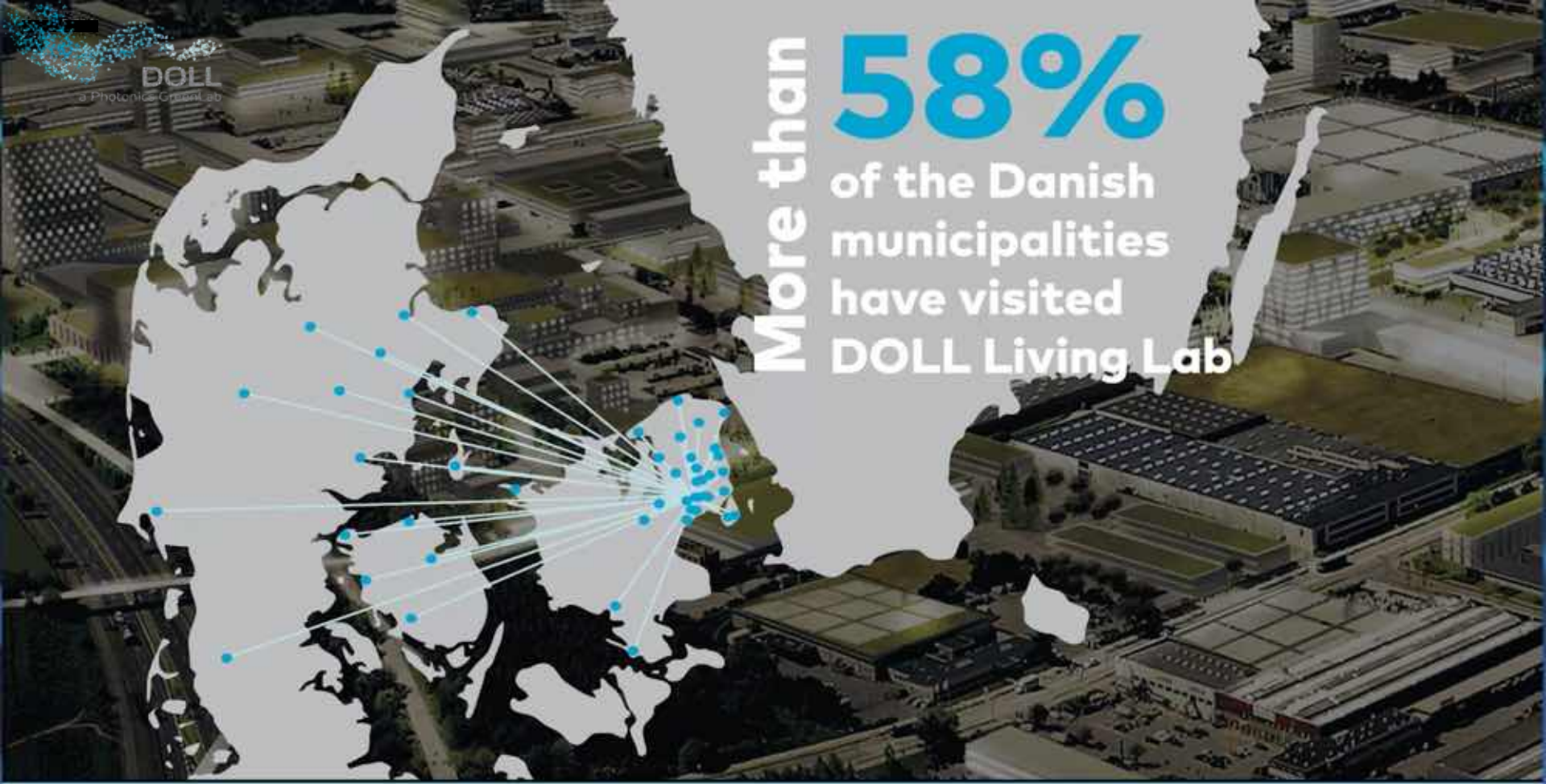
Kilde: Egen tilvirkning på baggrund af Downes & Nunes (2013)

- Period of time to reach 50 millions users

Phone	75 Years
Radio	38 Years
Television	13 Years
Internet	4 Years
iPod	3 Years
Facebook	1 Years
Twitter	9 Months
Angry Birds	35 Days
Pokémon Go	19 Days

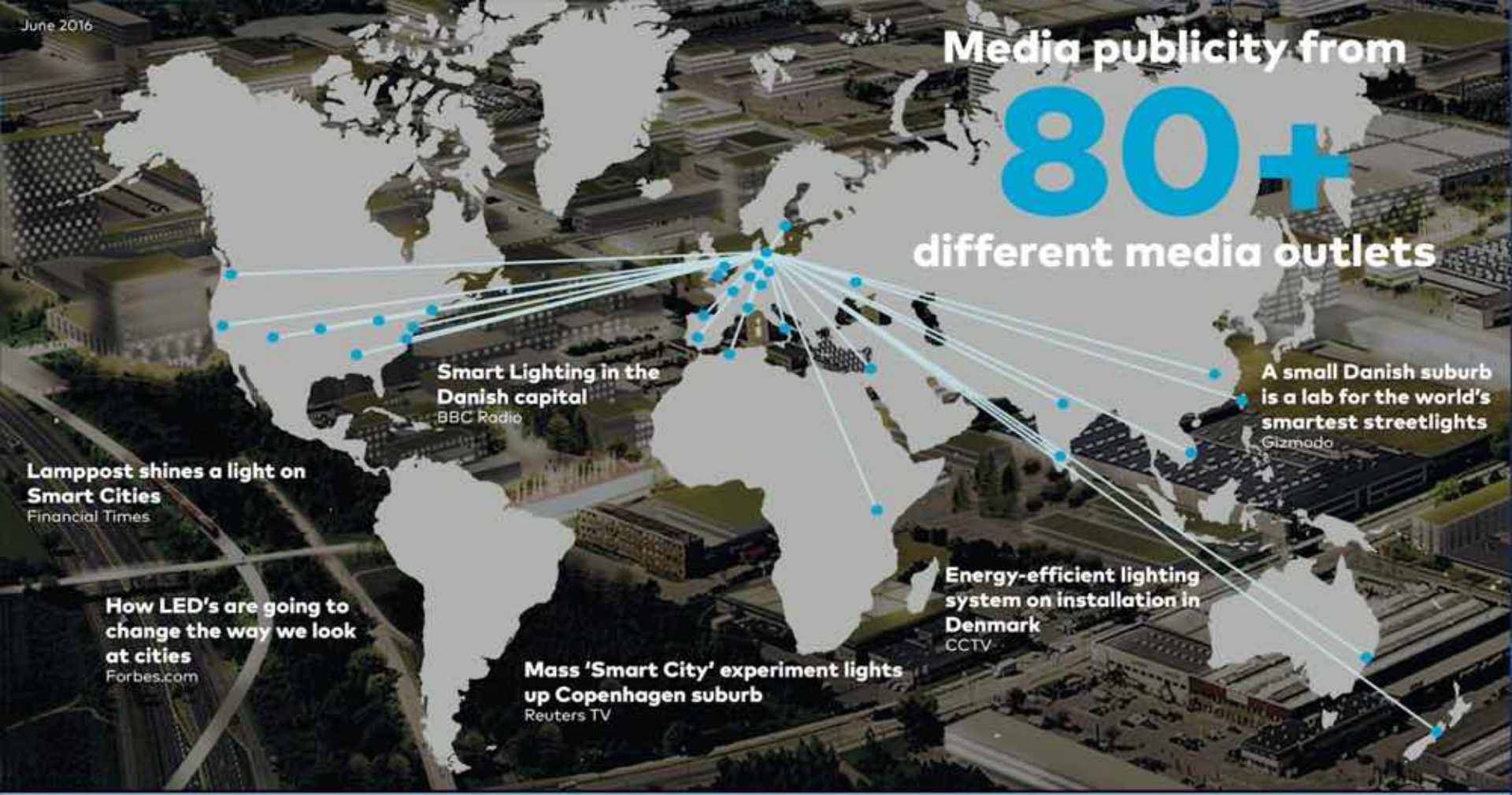
Kilde: Egen tilvirkning på baggrund af McKinsey & Company (2012)

DOLL
a Photonics GreenLab
1:1
DOLL Living Lab



Aabenraa - Aarhus - Albertslund - Allerød - Assens - Ballerup - Brøndby - Dragør - Egedal - Fanø - Faaborg-Midtfyn - Favrskov - Fredensborg - Frederiksberg - Frederikssund - Furesø - Gentofte - Gladsaxe - Glostrup - Greve - Gribskov - Halsnæs - Helsingør - Herlev - Herning - Hillerød - Horsens - Hvidovre - Høje-Taastrup - Hørsholm - Ishøj - Kalundborg - København - Lejre - Middelfart - Norddjurs - Nordfyn - Næstved - Odense - Randers - Roskilde - Rudersdal - Rødovre - Silkeborg - Tønder - Tårnby - Vallensbæk - Varde - Viborg - Vordingborg - and many more...

100+
cities worldwide from
30+
different countries have
visited DOLL Living Lab
(Danish cities not included)
Addis Ababa - Accra - Adelaide - Beijing - Birmingham - Bogotá - Dublin - Frogn - Guanzhou - Hong Kong - London - Malmö - New York - Oslo - Portland - Reykjavik - Rio de janeiro - Rygge - Seine et Marne - Seoul - Singapore - Stockholm - Sydney - Taipei - Time - Warszawa - Wellington - Xiaolab City - Zürich - Ås - and more...



Algiers - Beijing - Bengaluru - Berlin - Boston - Candas - Copenhagen - Denver - Detroit - Düsseldorf - Frankfurt - Hamborg - Harlan - Ho Chi Min City - Jersey City - Kiev - Kisumu - London - Lyon - Madrid - Nashua - Nashville - Negaunee - New Delhi - New York - Norwich - Paris - Philadelphia - Rom - Sacramento - San Jose - Seattle - Stockholm - Sydney - Taiwan - Tel Aviv - Washington D. C. - Wellington - and more...

Largest facility in Europe

- **Location:** A suburb to Copenhagen, industrial/commercial area, 10.000 employees
- **Area**: 1,5 km^2, 12 kilometres of road and bicycle lanes, our sandbox environment
- **Zones**: 49 zones with Lighting and smart city-technology
- **IoT-infrastructure**: 5 types of digital networks
- **Sensor network**: For waste, parking, air quality, noise, temp., etc.
- **Intelligent lighting network**: 435 connected light points, IP-address, real time control
- **Intelligent lighting solutions:** 80 different lighting lumieres
- **Management systems**: 20+ systems
- **Data platforms**: 1

CISCO
TDC
CITELUM
DONG energy
ZUMTOBEL
PHILIPS Lighting
EXLUMI
GATE 21
Europe's largest Showroom & Test Field for
Intelligent Lighting & Smart Urban Services
louis poulsen
THORN
swarco
PHILIPS
RIEGENS
DELUX
FAGERHULT
X LIGHT
OSRAM
citelum
DOLL
ROSA
current
SLIGHT
byteblocs
Schréder
ewo
LIT
caribani
100 m

50+ Partner Companies in DOLL Living Lab

50+ Gate 21 Partners

Delux Denmark
Riegens
Swarco Danmark
Focus Lighting
Thorn Lighting
X-Light
Fagerhult
Osram
Byteblocs
Smart Bin
Leapcraft
Cisco
Sweco
Trinonic
Louis Poulsen

Philips Danmark
Alfred Priess
Citelum
Dong Energy
EnergiMidt
SEAS NVE
Zumtobel Group
Danintra
Rosa
NordSense
SoundEar
Seneco
Telensa
Technical University of Denmark
Global Light Standard

TDC
LITE
Amplex
Schreder
Force Technology
Ewo
Lightwell
LED-mark ITS

Schneider Electric
IBM
NCC
Implement
Rambøll
HOFOR
Movia
Nobina
Vitani

Paradox
Big Belly
Joca
Sensity
TviLight
Wastecontrol
Exlumi
CommuniThings

Kuben Management
Next
Bloxhub
Ålborg University
Roskilde University
Capital Region
Region Zealand
42 municipalities

Intelligent Light System

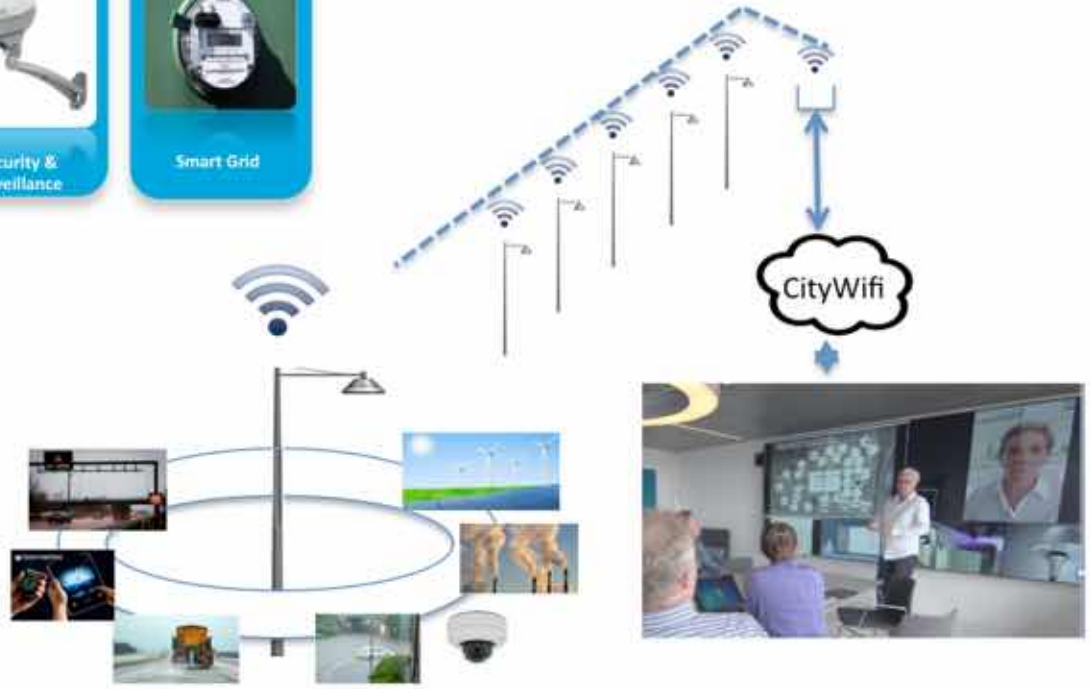
SENSING the WORLD…

NO_x and CO
Temperature
Pressure
Humidity
Ambient light
Rainfall
Wind
Particulate matter
Radiation
UVA/UVB

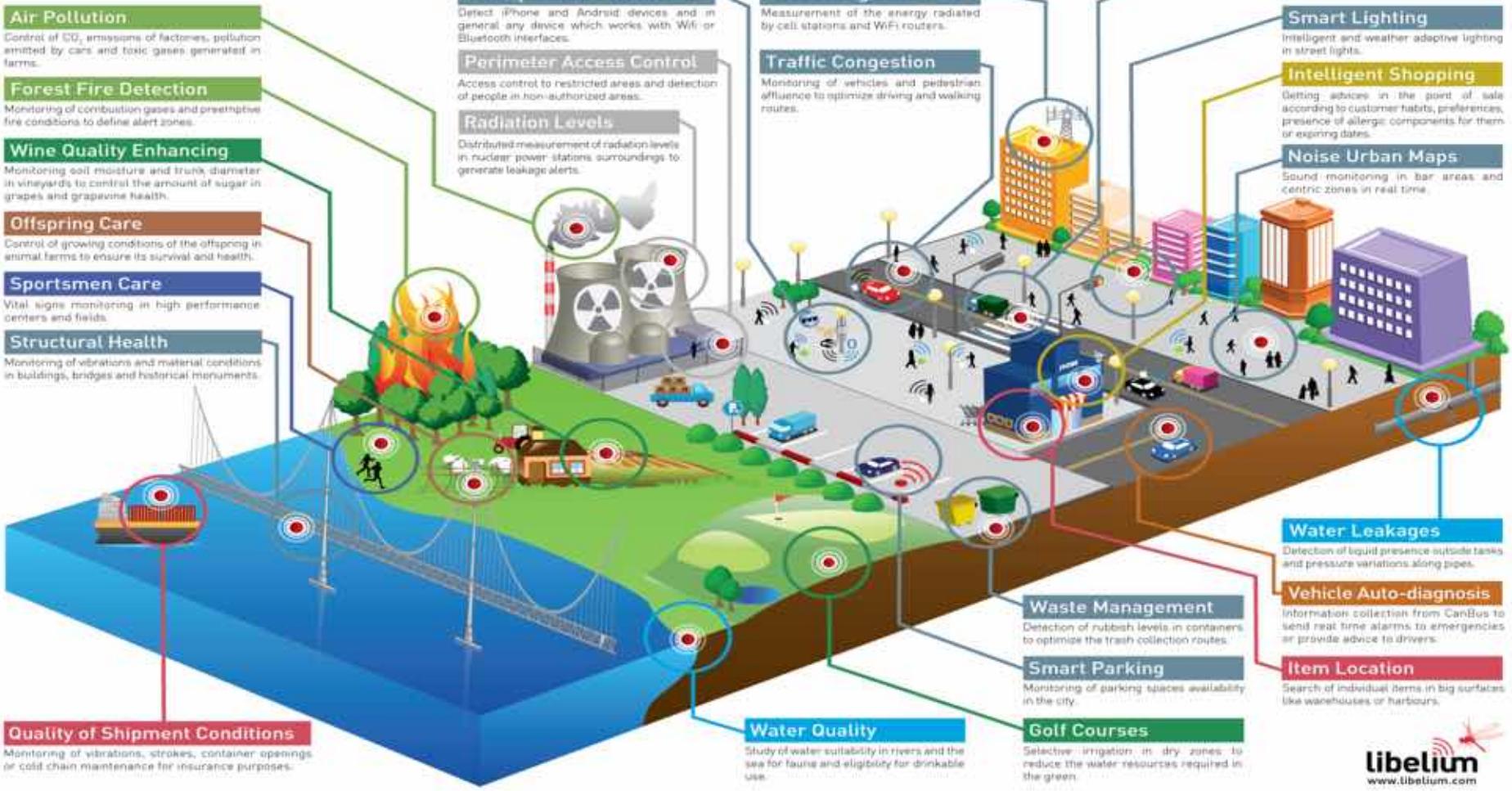
Real-time location systems (RTLS)
Ultrasound
IR
Power monitoring
Motion
Audio
Video
Accelerometer

Smart Urban Services

Innovation Platform



Libelium Smart World



Air Pollution
Control of CO_2 emissions of factories, pollution emitted by cars and toxic gases generated in farms.

Forest Fire Detection
Monitoring of combustion gases and preemptive fire conditions to define alert zones.

Wine Quality Enhancing
Monitoring soil moisture and trunk diameter in vineyards to control the amount of sugar in grapes and grapevine health.

Offspring Care
Control of growing conditions of the offspring in animal farms to ensure its survival and health.

Sportsmen Care
Vital signs monitoring in high performance centers and fields.

Structural Health
Monitoring of vibrations and material conditions in buildings, bridges and historical monuments.

Quality of Shipment Conditions
Monitoring of vibrations, strokes, container openings or cold chain maintenance for insurance purposes.

Smartphones Detection
Detect iPhone and Android devices and in general any device which works with Wifi or Bluetooth interfaces.

Perimeter Access Control
Access control to restricted areas and detection of people in non-authorized areas.

Radiation Levels
Distributed measurement of radiation levels in nuclear power stations surroundings to generate leakage alerts.

Electromagnetic Levels
Measurement of the energy radiated by cell stations and WiFi routers.

Traffic Congestion
Monitoring of vehicles and pedestrian affluence to optimize driving and walking routes.

Smart Roads
Warning messages and diversions according to climate conditions and unexpected events like accidents or traffic jams.

Smart Lighting
Intelligent and weather adaptive lighting in street lights.

Intelligent Shopping
Getting advices in the point of sale according to customer habits, preferences, presence of allergic components for them or expiring dates.

Noise Urban Maps
Sound monitoring in bar areas and centric zones in real time.

Water Leakages
Detection of liquid presence outside tanks and pressure variations along pipes.

Vehicle Auto-diagnosis
Information collection from CanBus to send real time alarms to emergencies or provide advice to drivers.

Item Location
Search of individual items in big surfaces like warehouses or harbours.

Waste Management
Detection of rubbish levels in containers to optimize the trash collection routes.

Smart Parking
Monitoring of parking spaces availability in the city.

Water Quality
Study of water suitability in rivers and the sea for fauna and eligibility for drinkable use.

Golf Courses
Selective irrigation in dry zones to reduce the water resources required in the green.

libelium
www.libelium.com

Potentials

1 New green solutions

- Street lighting
- Waste management
- Climate Adaptation
- Traffic Management
- Power Supply
- Circular Economy

2 Effective municipal operation

- Optimal utilization of the municipality's values (properties, cars, etc.)
- Optimal planning
- Platform for mobile workflow support

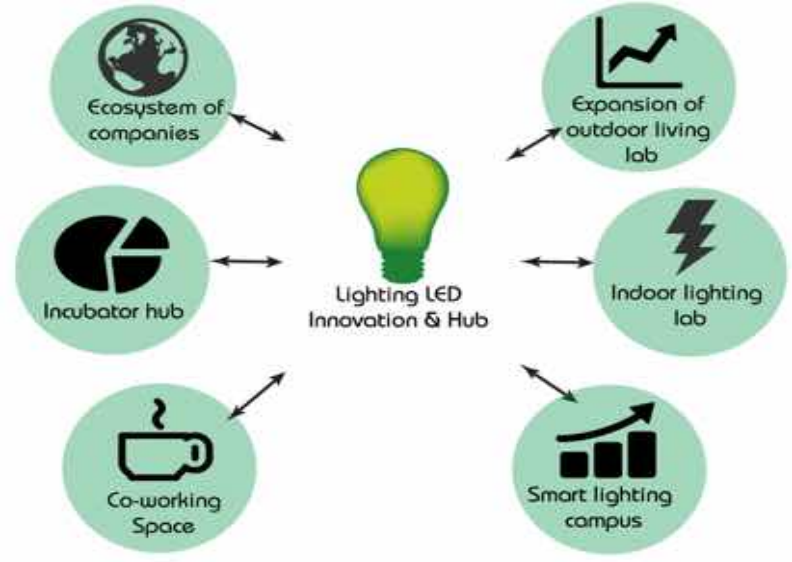
3 Improved service for citizens

- New ways of involving citizens
- Better services to citizens

4 Growth through innovation

- Providing public open data can boost innovation

Innovation Platform
Start Up
Incubation



Thank you