Smart Low-carbon city development

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Smart Low-carbon City seminar/workshop
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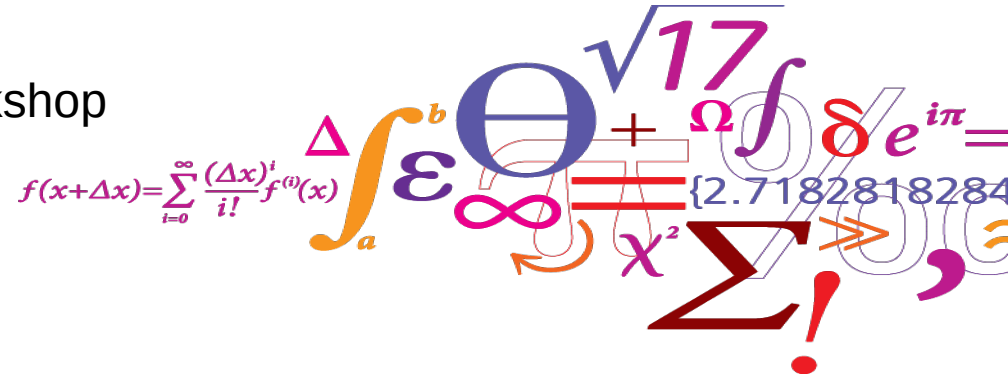

DTU Management Engineering
Institut for Systemer, Produktion og Ledelse

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Table of content

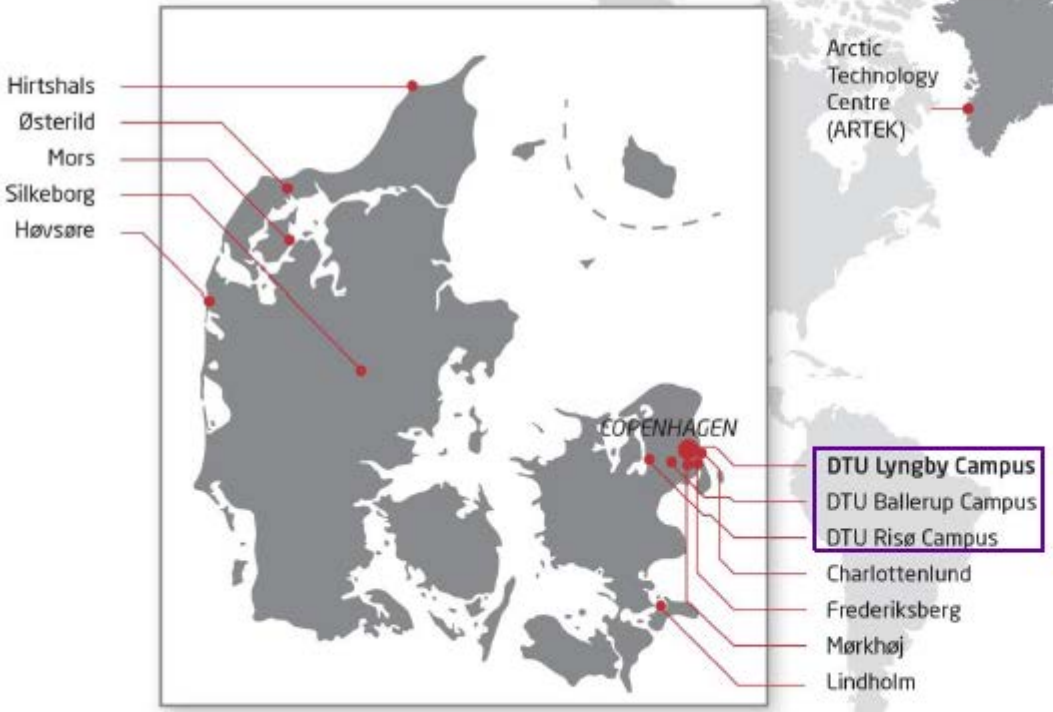
- What are you doing?
- Technical University of Denmark (DTU)
- Mega trends
- Definition of a smart city (low-carbon city)
- Danish national energy planning
- Danish municipal planning
- Danish power system, power consumption patterns, challenges
- Centre for IT Intelligent Energy Systems (CITIES)
- The Danish Power hub
- European legislation on protection of person data
- IoT solution on air pollution monitoring
- Summary

What are we doing which is smart?

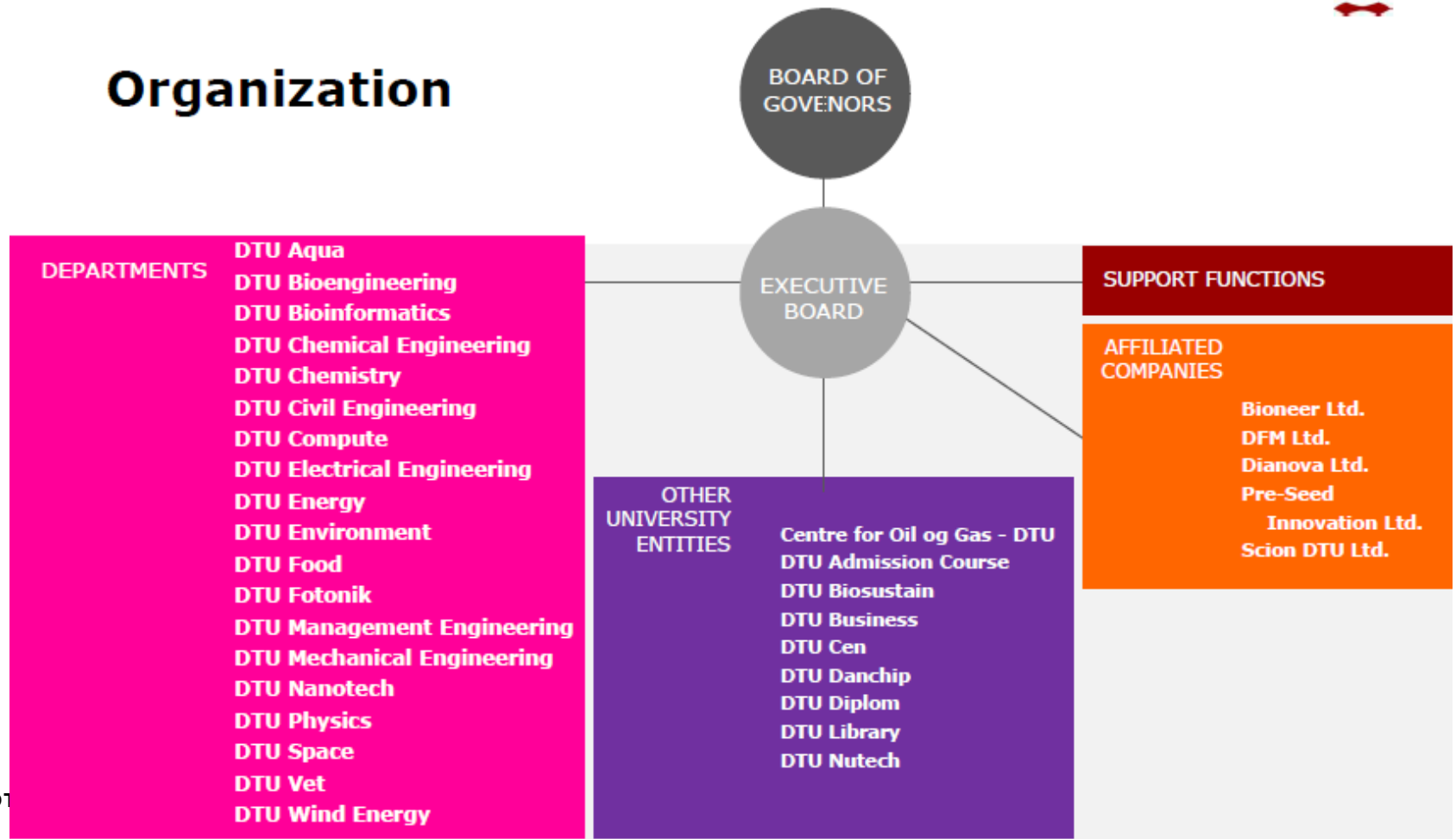
Maybe you work in teaching and research?
Maybe you work in the energy sector?
Maybe you work in an IT department of a company?
Maybe you work in a software developing company?
Maybe you work in a company developing IoT solutions?
Maybe you work in the city/municipality/local government? Implementing smart city solutions?
Maybe you work on Blockchain solutions? Robotics?
Maybe you work on Data security? --- a Hacker!!!???
Maybe you do machine learning developing autonomous vehicles?
Maybe you do machine learning in developing autonomous businesses?

University locations across the kingdom

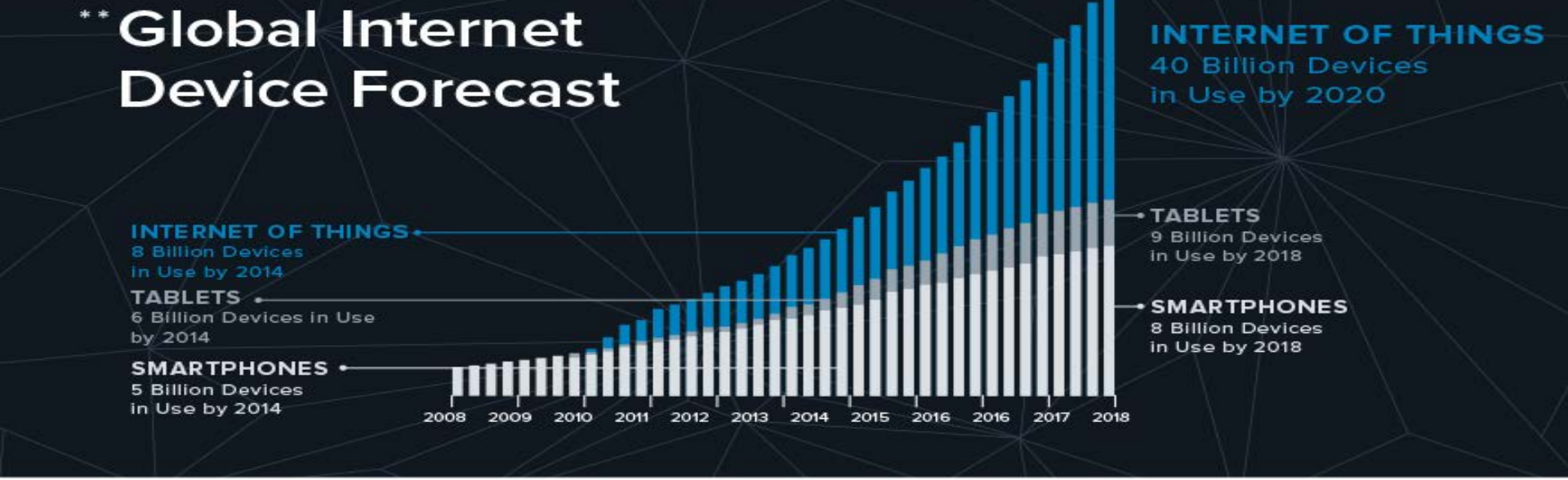
- centered in the capital region



Organization



** Global Internet Device Forecast



† There will be as many as

40 TO 80 BILLION

connected objects by 2020.

There will be **10** connected objects for every man, woman, and child on the **PLANET.**

http://visual.ly/future-internet-things

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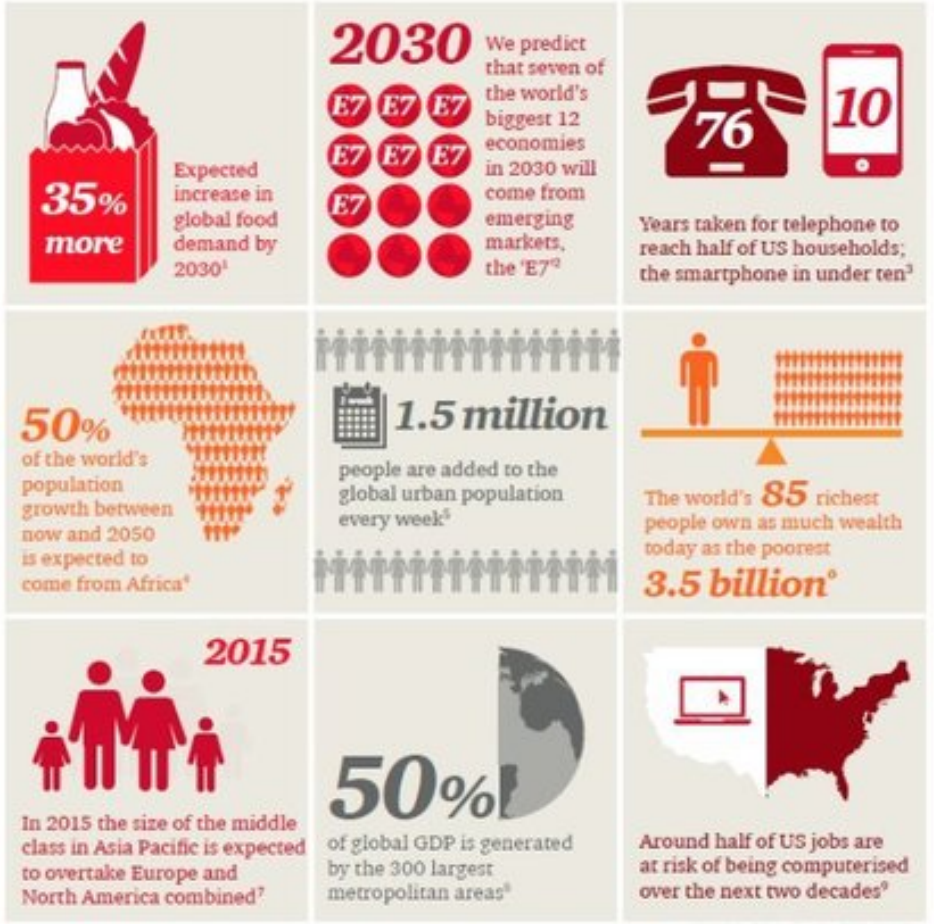
Through the power of smart devices, people will not only consume data, but contribute observed data to the IoT through their phones and tablets as

human sensors

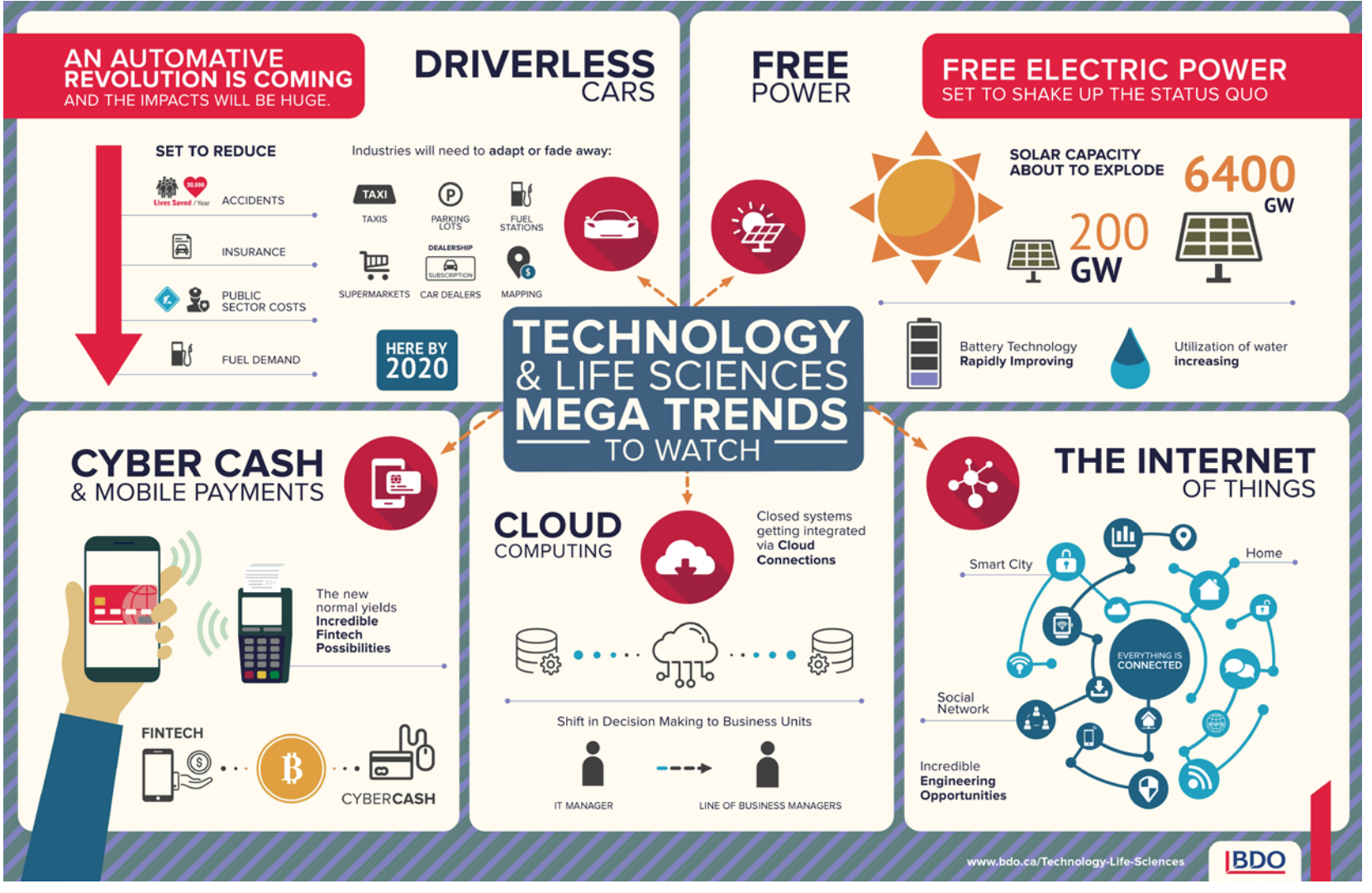
http://visual.ly/future-internet-things

Five global mega trends shaping the future

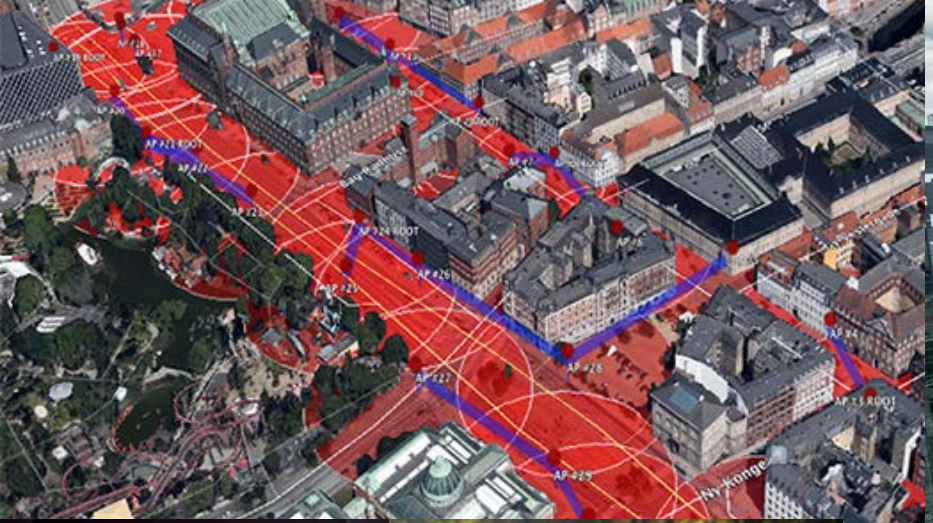
- **Rapid urbanisation**
- **Demographic and social change**
- **Climate change and resource scarcity**
- **Shift in global economic power**
- **Technological breakthroughs**



source: PwC via @mikequindazzi


AN AUTOMATIVE REVOLUTION IS COMING
AND THE IMPACTS WILL BE HUGE.
DRIVERLESS CARS
SET TO REDUCE
ACCIDENTS
INSURANCE
PUBLIC SECTOR COSTS
FUEL DEMAND
Industries will need to adapt or fade away:
TAXIS
PARKING LOTS
FUEL STATIONS
SUPERMARKETS
CAR DEALERS
MAPPING
HERE BY 2020
FREE POWER
FREE ELECTRIC POWER
SET TO SHAKE UP THE STATUS QUO
SOLAR CAPACITY ABOUT TO EXPLODE
6400 GW
200 GW
Battery Technology Rapidly Improving
Utilization of water increasing
TECHNOLOGY & LIFE SCIENCES MEGA TRENDS TO WATCH
CYBER CASH & MOBILE PAYMENTS
The new normal yields Incredible Fintech Possibilities
FINTECH
CYBERCASH
CLOUD COMPUTING
Closed systems getting integrated via Cloud Connections
Shift in Decision Making to Business Units
IT MANAGER
LINE OF BUSINESS MANAGERS
THE INTERNET OF THINGS
Smart City
Home
Social Network
EVERYTHING IS CONNECTED
Incredible Engineering Opportunities
www.bdo.ca/Technology-Life-Sciences
BDO

DTU



Translation

Definition of a smart city

"The Smart Energy City is highly energy and resource efficient, and is increasingly powered by renewable energy sources; it relies on integrated and resilient resource systems, as well as insight-driven and innovative approaches to strategic planning. The application of information, and communication technology are commonly a means to meet these objectives. The Smart Energy City, as a core to the concept of the Smart City, provides its users with a liveable, affordable, climate-friendly and engaging environment that supports the needs and interests of its users and is based on a sustainable economy."

What does it mean that we try to connect all aspects of Smart City?

National energy planning in Denmark

- The first official energy plan was made in 1976 – as a response to the first oil crisis 1973-1975 – focus on energy supply – it was challenged by an alternative energy plan from academia
- Debate of the role of nuclear power in Denmark 1975-1985 – the second official energy plan introduce in 1981 – followed by an alternative energy plan from academia in 1983. Denmark eventually deciding against nuclear power in 1985
- From 1979 -1989 an investment subsidy on installation of wind turbines was introduced
- An important policy was introduction of feed-in tariffs on wind power in 1992.
- Since 2000 we have had quite a number of studies on developing 100% renewable energy scenarios for Denmark
- Denmark has a history of energy agreements across all parties in the parliament

Current Danish national energy plan

The government's energy policy milestones up to 2050

In order to secure 100 pct. renewable energy in 2050 the government has several energy policy milestones in the years 2020, 2030 and 2035. These milestones are each a step in the right direction, securing progress towards 2050.

2020

Half of the traditional consumptions of electricity is covered by wind power

2030

Coal is phased out from Danish power plants

Oil burners phased out

2035

The electricity and heat supply covered by renewable energy

2050

All energy supply – electricity, heat, industry and transport – is covered by renewable energy

The initiatives up to 2020 will result in a greenhouse gas reduction by 35 pct. in relation to 1990.

The Danish governments energy policy

The governments targets on energy policy	Results for 2020 of the latest energy agreement 2013
100% of energy consumption covered by renewable energy in 2050	A significant step towards reducing the use of fossil fuels and transition to 100% renewable energy sources – requiring a reduction of fossil fuels of 25% from 2010 to 2020.
100% of electricity and heating covered renewable energy in 2035	On the way to half the use of fossil fuel for power and heating from 2010 to 2020.
No coal by 2030	Use of coal will be reduced with 60% I 2020 from 2010 – mainly replaced with biomass.
No oil (for heating) by 2030	Ban for allowing new oil boilers in new building from 2013. Other initiatives for changing exiting ones.
Wind will cover half of the electricity consumption in 2020	Wind is expected to cover 49.5% of electricity consumption in 2020

Strategic energy planning

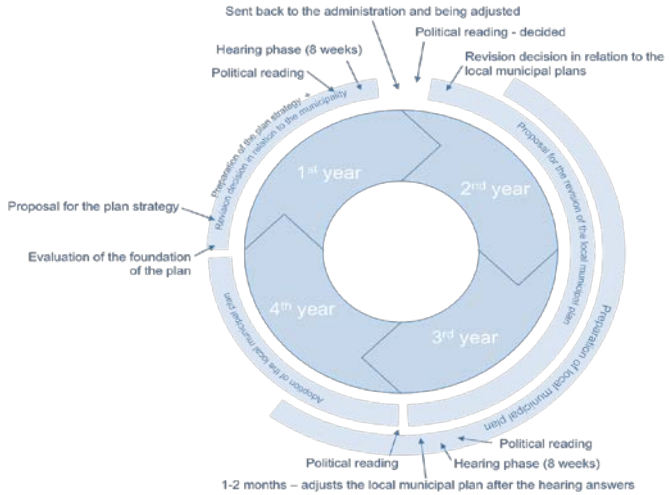
The government decides on the overall rules in the energy sector

The government define policies which encourages/pushes municipalities to implement low-carbon initiatives

The government supports project on local strategic energy planning – but in the end of the day the investments will have to come from the local municipalities or utilities

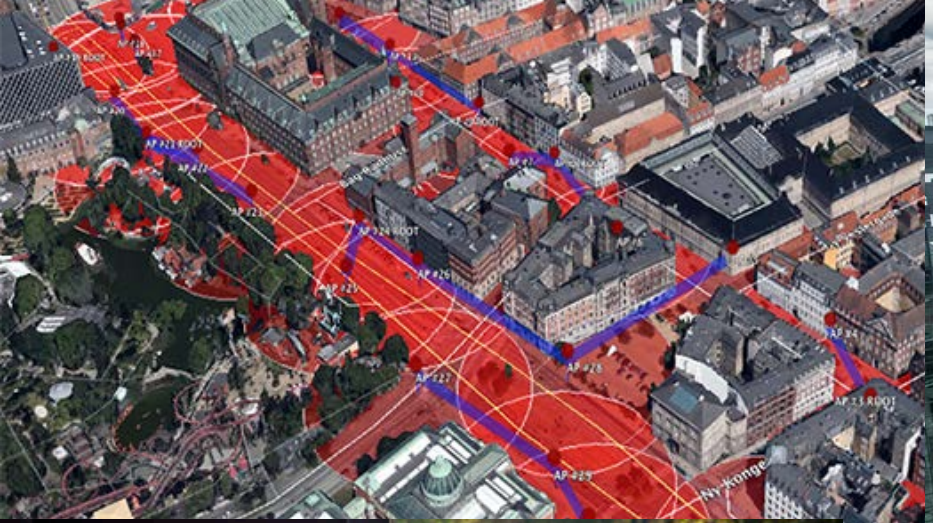
Revision of the local municipal plan

We have a 1 year cycle
– which is part of a 4 year cycle
– which is part of 12 year cycle



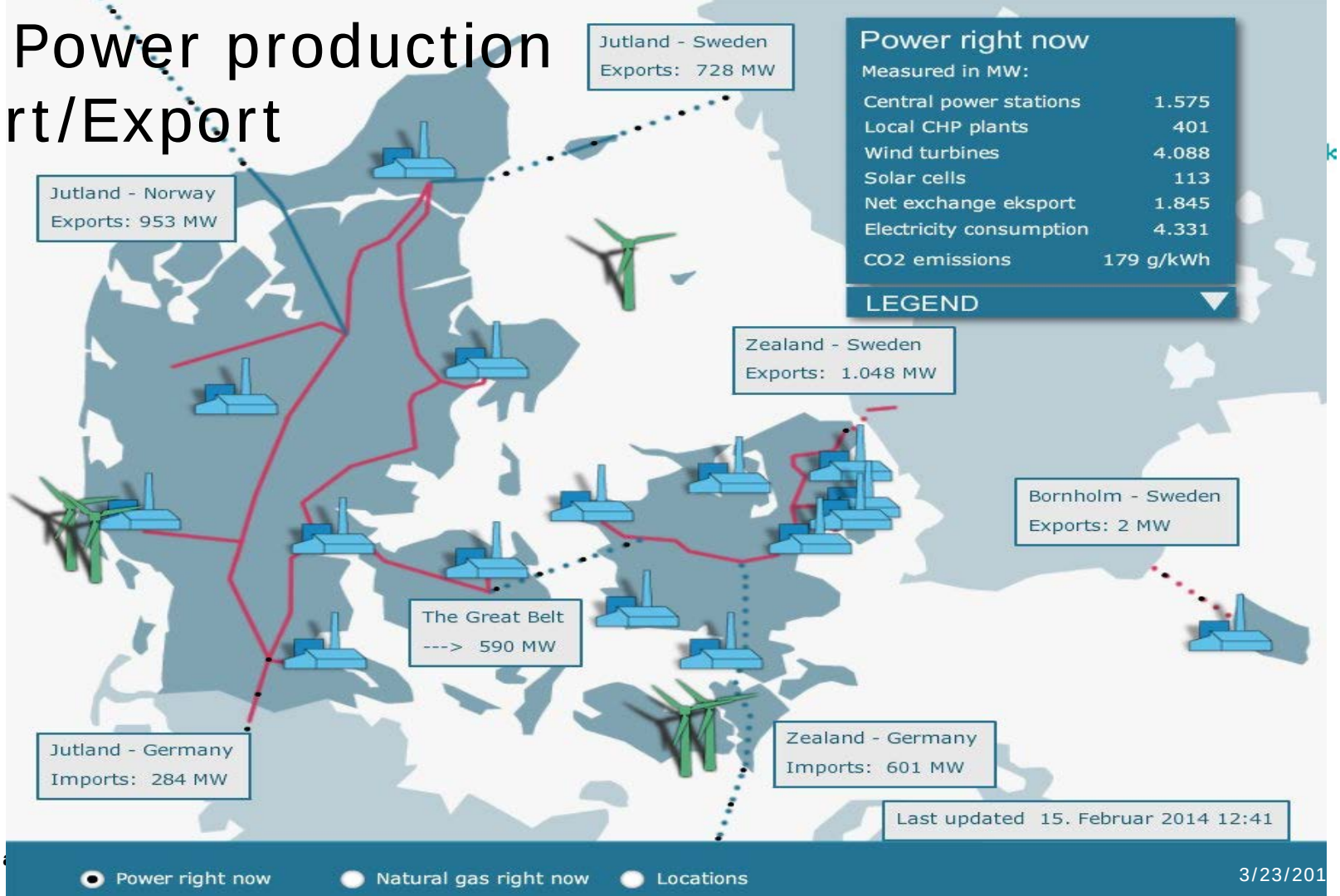
The phases in developing a district plan

Step	Details	Duration
Clarification	Preliminary dialogue	4-8 weeks
Initial description	Preparation of initial description	1 week
	Political reading of initial description	4 weeks
District Plan proposal	Preparation of plan proposal incl. internal hearing	6-8 weeks
	Political reading of the proposal	5-6 weeks
	Announcement and publication	1
	Public hearing	8 weeks
The final district plan	Processing objections	2-4 weeks
	Adjustment of changes	1 week
	Political reading of final plan	5-6 weeks
	Announcement and publication	1 week
	Period of appeal	4 weeks

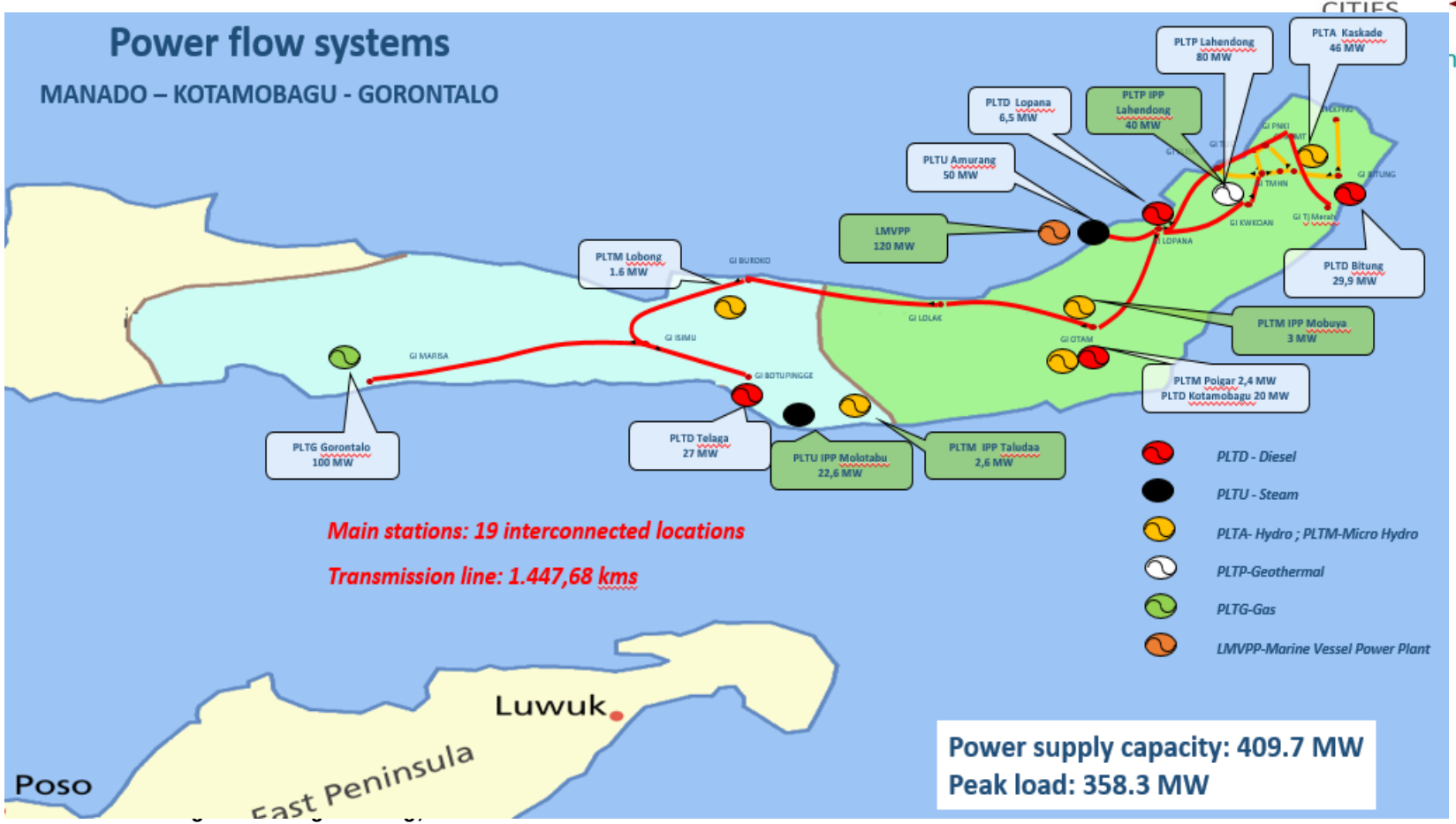


Translation

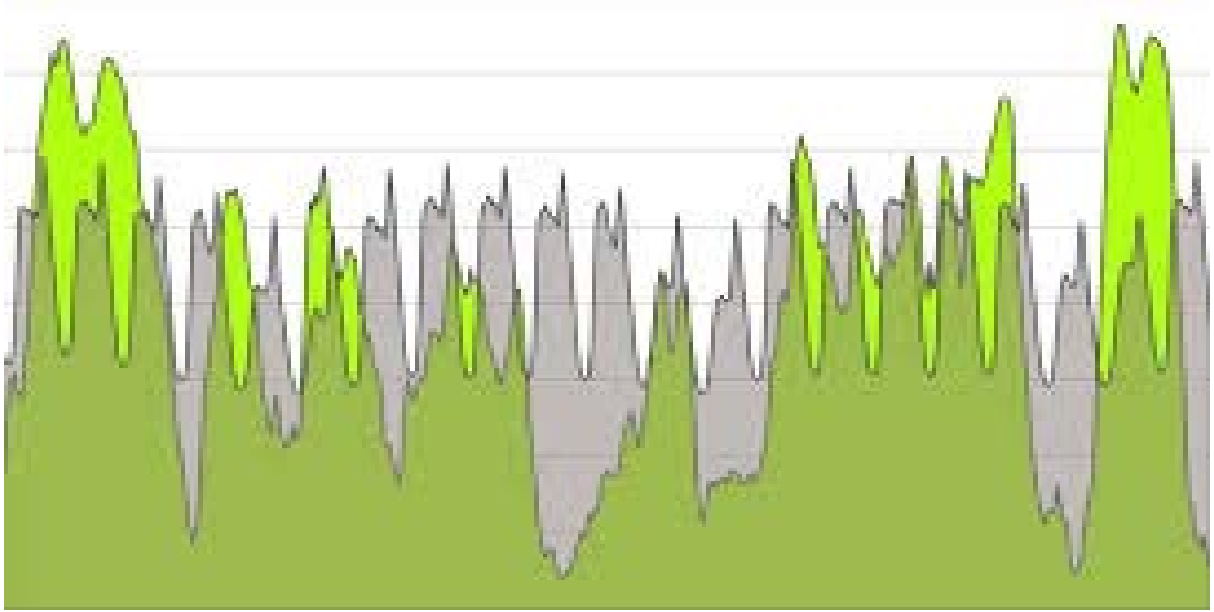
Danish Power production – Import/Export



Power flow systems in Manado (PLN, 2017)

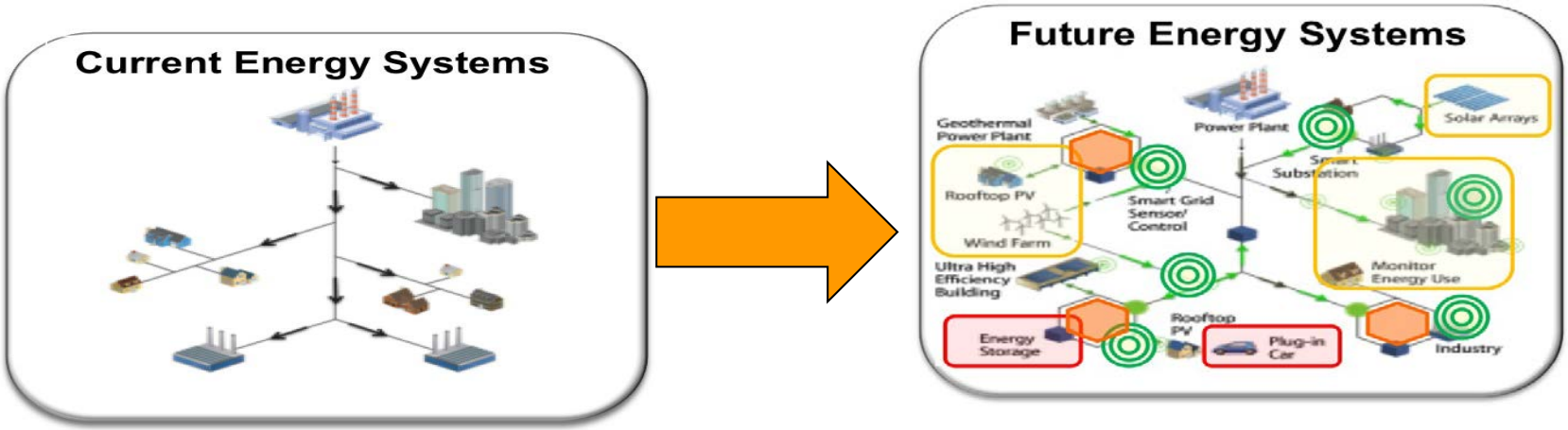


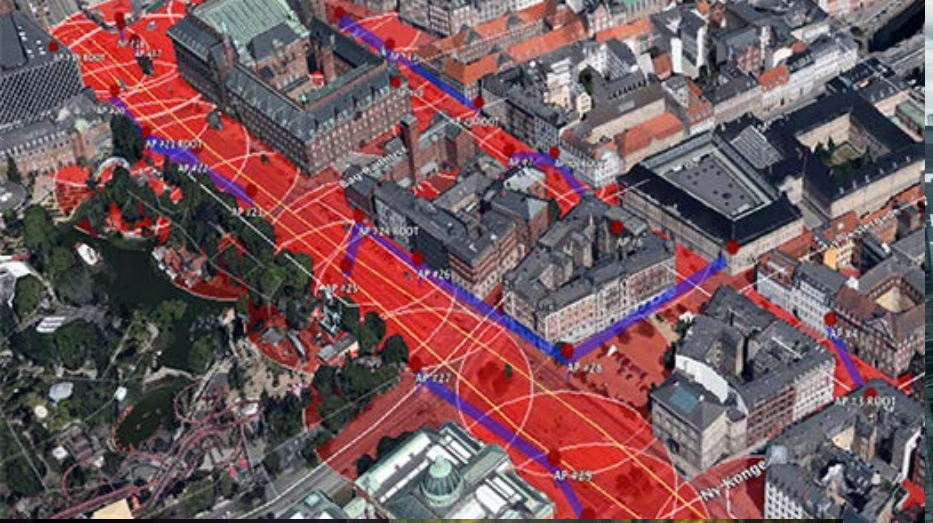
Electricity production (green) and electricity consumption (grey) over three weeks in Denmark



Change towards smart netvorks or decentral solutions

- From centralised to decentralised production



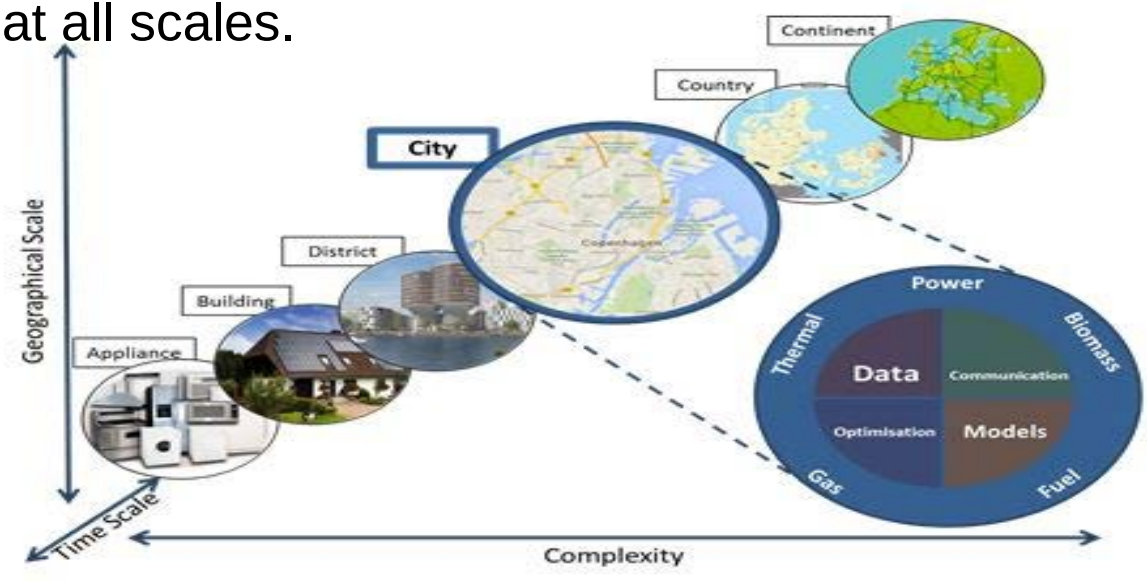


Translation

Centre for IT Intelligent Energy Systems - CITIES

Scientific Objective

To establish **methodologies and ICT solutions** for **design and operation** of integrated electrical, thermal, fuel pathways at all scales.

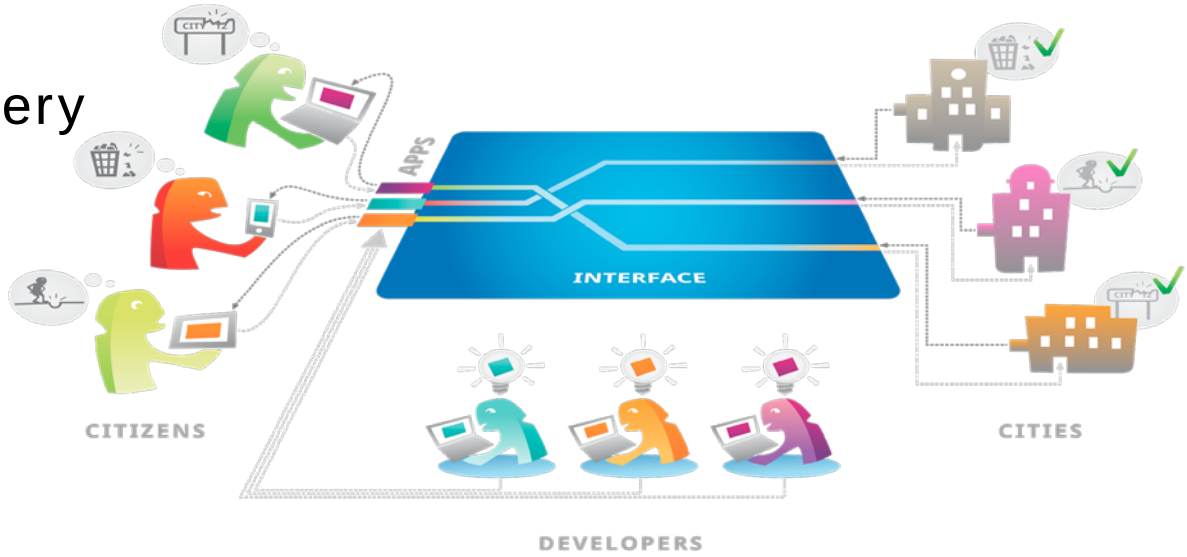


Key Outcomes

- Modular forecasting and control models/tools for a variety of energy system components, including their interactions
- Market structures that support energy systems integration
- Operational methods and scenarios for energy systems integration and management, scenarios towards a fossil free future (Power and heating sectors fossil fuel free in year 2035)
- **2014-2019, 10 €Mio (Innovationfond Denmark 6 €Mio, 38 partners)**
- **18 Demo Projects finished, ongoing and planned.**
- **80 published papers**
- **Setting up an Innovation Centre**
- **www.smart-cities-centre.org**

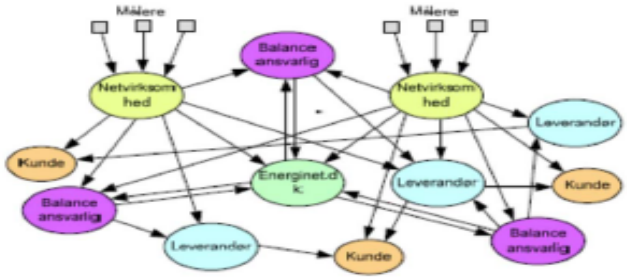
Open Data for Smart Cities: what are the benefits?

- Transparency
- Accountability
- Efficiency
- Public Service Delivery
- Engagement
- Data Improvement
- Societal value
- Economic value



The Danish DataHub solution

From decentralized market management



Winter 2012/-13

to centralized market management

Keywords: Digitization, unbundling, efficiency and transparency

Upcoming European protection of personal data (May 2018)

Regulate the use and protection of personal data.

Major changes:

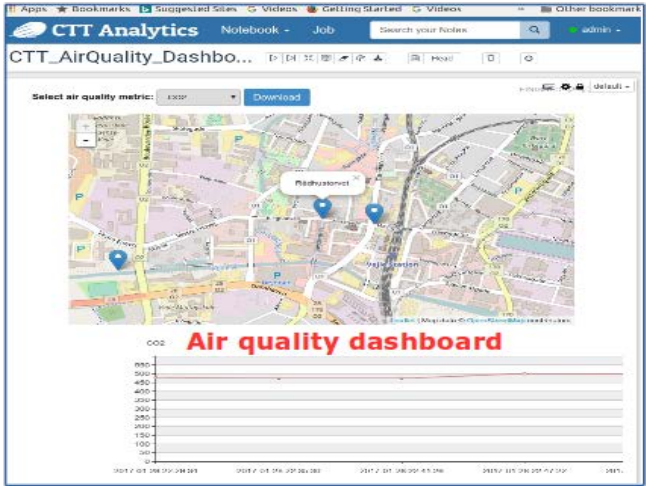
- Elaborates the rights of the registered
- Right to be forgotten
- Data portability: Take ALL your data from one social media to another.
- Stricter documentation requirements: Must be able to document the effort in securing data
- Higher fines: % of global sales

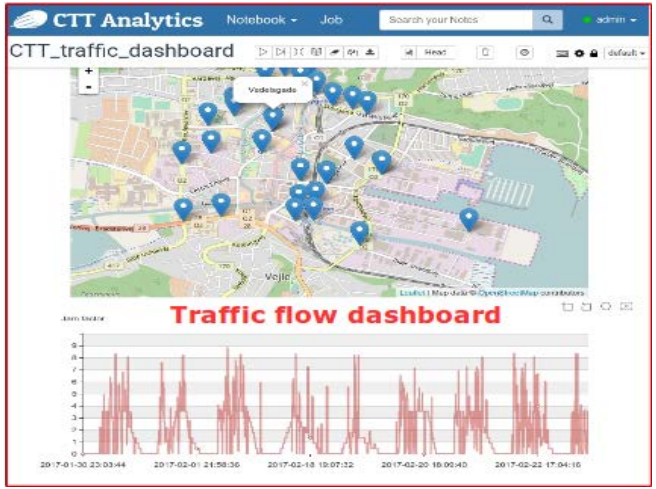
Intended to harmonize

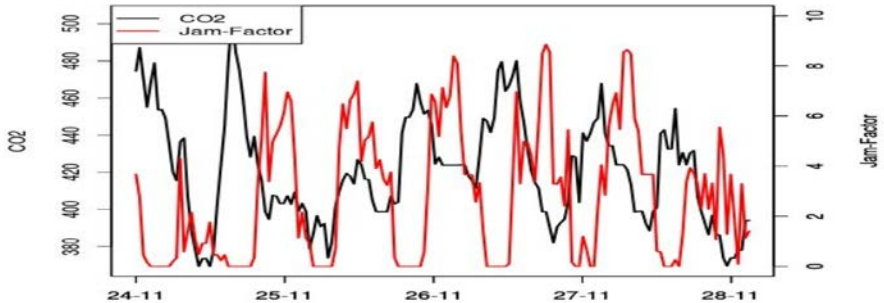
- But approximately 50 areas where each country can make own legislation
- The area is still going to be complicated to rule

IoT sensors for monitoring air quality

Analytics and visualization

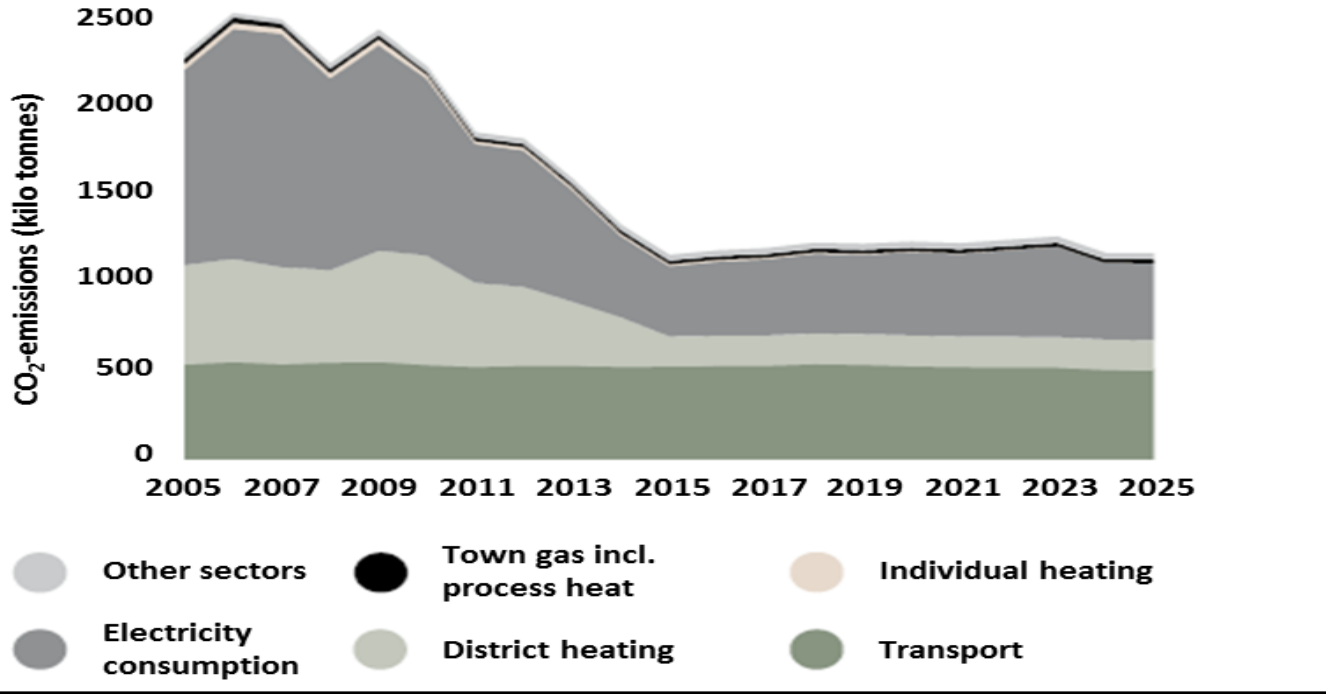






Model the correlation between traffic jam factor and CO2

Copenhagen to become carbon neutral



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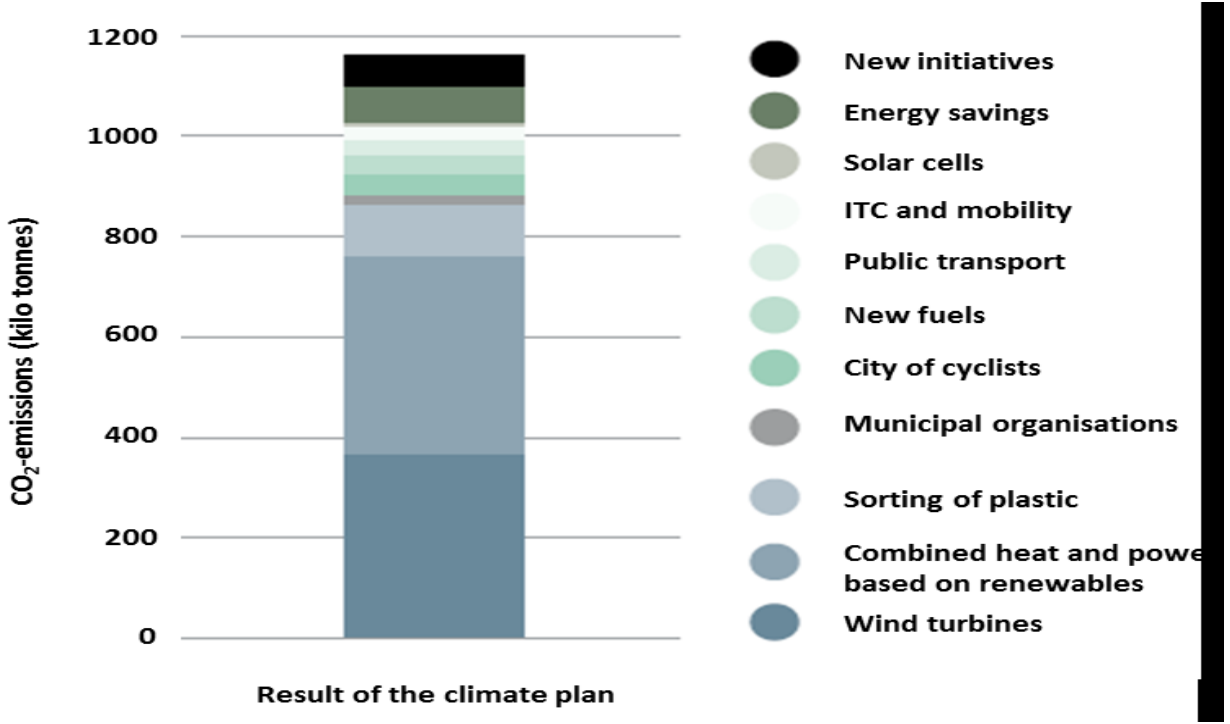


Some projects

Tranform: http://www.transformyourcity.eu/

CITIES: www.smart-cities-centre.org

ClairCity: http://www.claircity.eu/

Smart City Accelerator: www.skoleklima.dk

ESPON: https://www.espon.eu/sites/default/files/attachments/Locate_draft-final-report_0.pdf

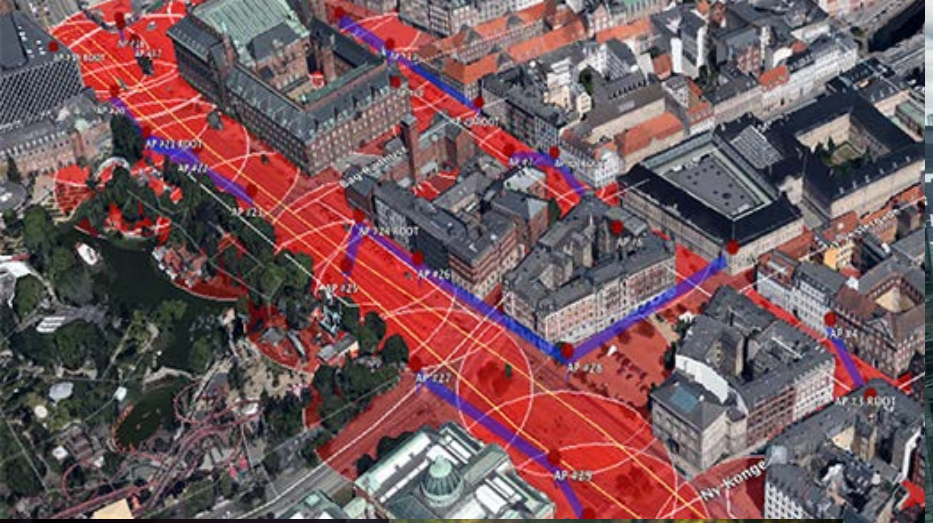
CITIES Innovation Center: https://www.citiesinnovation.org/

Summary

Development of Smart cities is about smart people working with smart stakeholders with smart cities with smart solutions. Everyone needs to work together.

Everyone should see it as an opportunity to engage with the citizens, the customer, the smart people out there to develop solution for the good of the society. The idea is not to be in full control of what is going on – but let the initiative take over.

Each smart city solution may look small and insignificant but each small solution makes a different in the big picture – when it all works together.



Thank you
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