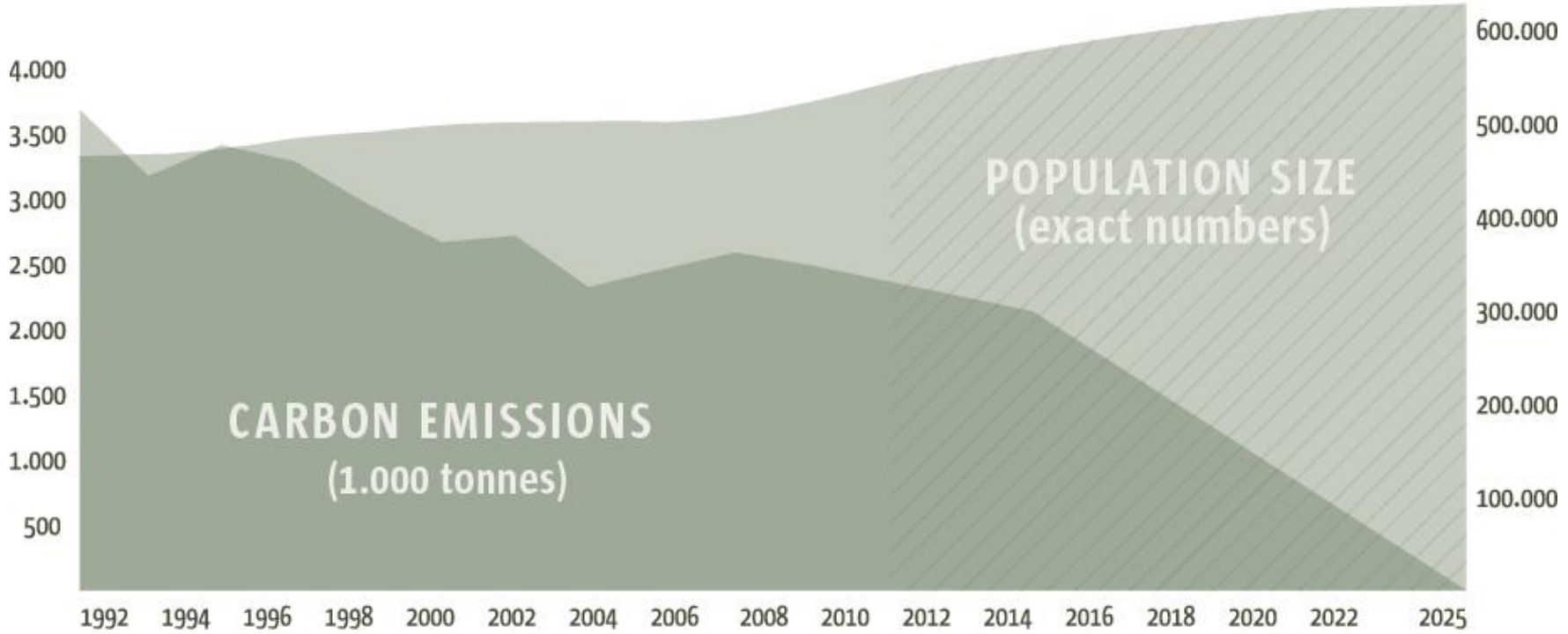
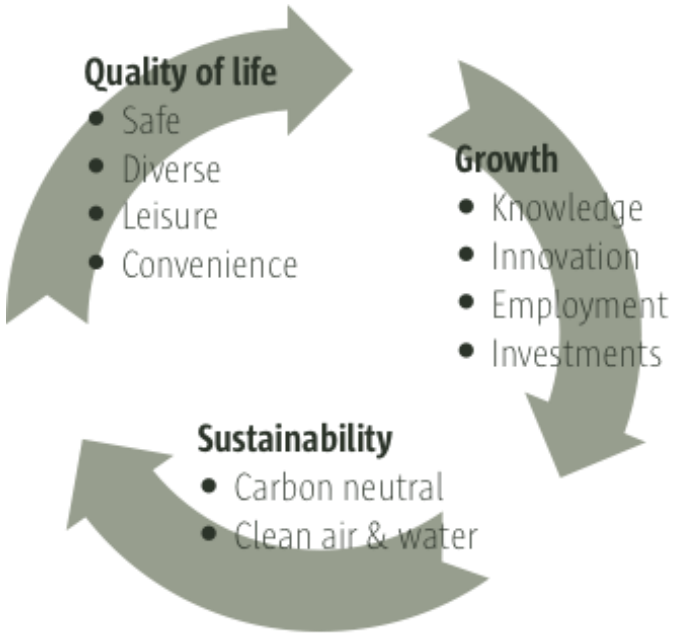
Copenhagen Smart City

The challenge



The Copenhagen Story

Global view



User involvement

Making the Smart City

- The smart city has sustainability, growth and quality of life as a solid foundation
- The smart city requires innovative partnerships and technological development
- The smart city uses the data generated within the city for creating intelligent, resource optimized and energy efficient solutions for the users of the city
- The smart city has innovative solutions spanning all city services and involves the city, citizens, users, businesses and knowledge institutions as active participants in creating new and smart city solutions
- The smart city is a test facility for testing new technology
- The smart city attracts businesses and a highly skilled workforce

European Green Capital 2014

COPENHAGEN
Finalist 2014
EUROPEAN
GREEN CAPITAL
An initiative of the
European Commission

SHARING
COPENHAGEN
2014

Vision and goals

COPENHAGEN VISION

COPENHAGEN HAS THE WORLD´S BEST URBAN ENVIRONMENT AND A UNIQUE URBAN LIFE.

CARBON NEUTRAL CAPITAL

WORLD'S BEST CITY FOR CYCLISTS

GREEN AND BLUE CAPITAL

CLEAN AND HEALTHY CITY

World’s best city for cyclists

WORLD’S BEST CITY FOR CYCLISTS

SHARING
COPENHAGEN
2014

WORLD'S BEST CITY FOR CYCLISTS

- AT LEAST 50 % OF PEOPLE WILL GO TO THEIR WORK PLACE OR EDUCATIONAL INSTITUTION IN COPENHAGEN BY BIKE.
- THE NUMBER OF SERIOUSLY INJURED CYCLISTS IN COPENHAGEN TO BE HALVED COMPARED TO TODAY.
- AT LEAST 80 % OF CYCLISTS IN COPENHAGEN TO FEEL SAFE AND SECURE IN TRAFFIC.
- A REDUCTION OF COPENHAGEN'S CO_2 EMISSIONS OF AT LEAST 20 % COMPARED TO TODAY.

Carbon neutral capital

CARBON NEUTRAL CAPITAL

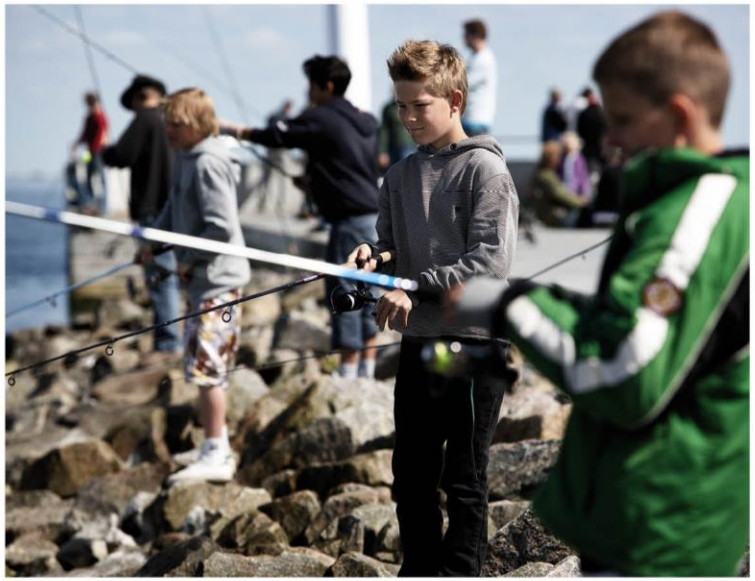
SHARING
COPENHAGEN
2014

CARBON NEUTRAL CAPITAL

- A REDUCTION OF COPENHAGEN'S CO_2 EMISSIONS OF AT LEAST 20 % COMPARED TO TODAY.
- COPENHAGEN CARBON NEUTRAL BY 2025

A green and blue city

A GREEN AND BLUE CITY



SHARING
COPENHAGEN
2014

A GREEN AND BLUE CITY

- 90 % OF COPENHAGENERS SHOULD BE ABLE TO WALK TO A PARK, A BEACH, A NATURAL AREA OR SEA SWIMMING POOL IN LESS THAN 15 MINUTES.
- COPENHAGENERS WILL BE VISITING THE CITY'S PARKS, NATURAL AREAS, SEA SWIMMING POOLS AND BEACHES TWICE AS OFTEN AS TODAY.

A clean and healthy city

A CLEAN AND HEALTHY CITY

SHARING
COPENHAGEN
2014

A CLEAN AND HEALTHY CITY

- COPENHAGENERS SHOULD BE ABLE TO SLEEP PEACEFULLY, FREE FROM NOISE FROM STREET TRAFFIC. ALL SCHOOLS AND INSTITUTIONS SHOULD BE SUBJECT TO ONLY LOW TRAFFIC NOISE LEVELS.
- THE AIR SHOULD BE SO CLEAN THAT COPENHAGENERS' HEALTH WILL NOT BE DAMAGED.
- THERE SHOULD BE AT LEAST 20 % ORGANIC FOOD IN THE CITY'S FOOD CONSUMPTION.
- THE CITY TO LEAD THE WAY WITH AT LEAST 90 % ORGANIC FOOD IN ITS INSTITUTIONS.
- COPENHAGEN SHOULD BE EUROPE'S CLEANEST CAPITAL AND ONE OF THE CLEANEST CAPITALS IN THE WORLD. RUBBISH SHOULD BE CLEARED FROM PUBLIC STREETS WITHIN EIGHT HOURS.

Smart Projects

Work with targeted **use of data** in solving problems

Work with **new technology** or known technology in new ways

Work with **efficient** use of the Municipality's or city's **resources**

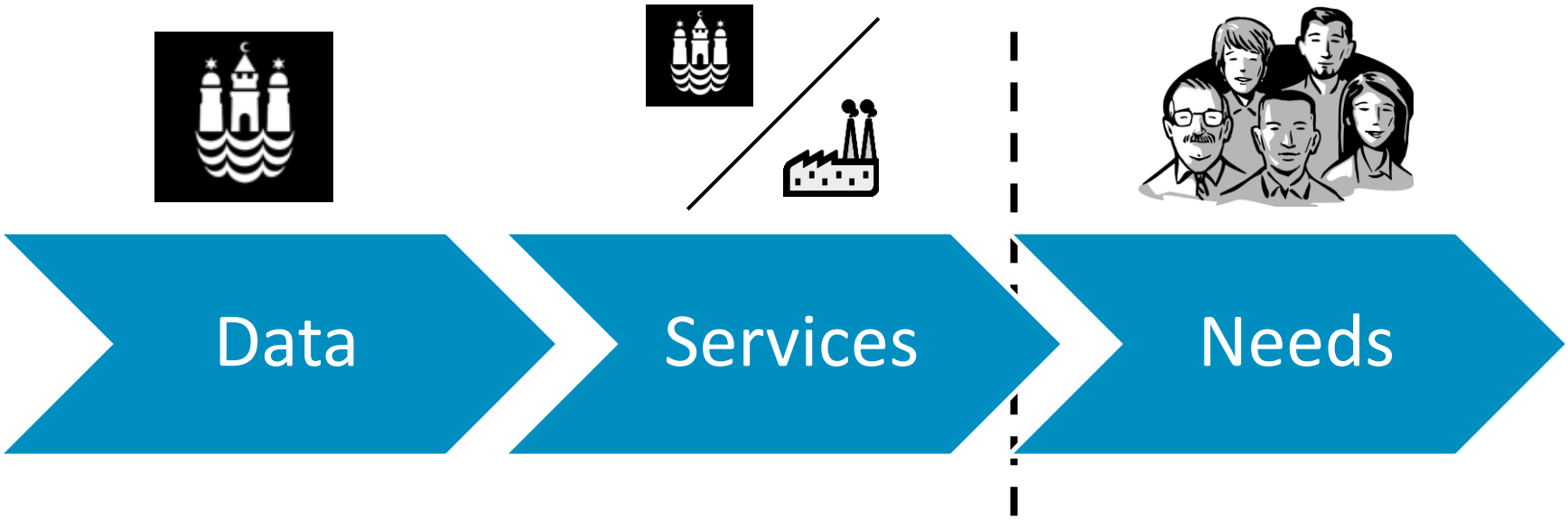
Work with new ways of **involving citizens** or **businesses**

New Smart City Initiatives

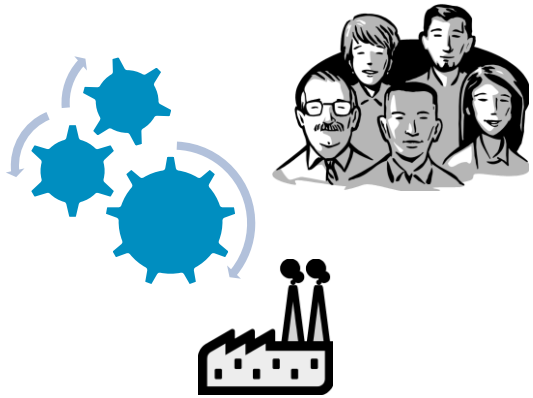
- Co-operation across seven adminstrations
- Project coordination board
- One strategi for Smart City
- Focus on lighthouse projects
  - Open city data platform
  - Copenhagen map
  - Big data platform with partners
  - Copenhagen Solution Lab
  - Mobility projects and ITS
  - Digital infrastructure
  - (and many more…)

Open city data platform

How It Is Today



The Future



Open Data → Services → Needs

Innovation

Growth

Entrepreneurship

Citizen Involvement

Relevant solutions

Open Data in Copenhagen

IMPROVE OWN DECISION MAKING
Enable holistic overview, better planning, improved transparency and build enterprise-wide architecture and processes for doing so

CREATE A DATA MARKETPLACE
Promote innovation, creativity, inclusion and solve challenges through public/private cooperation

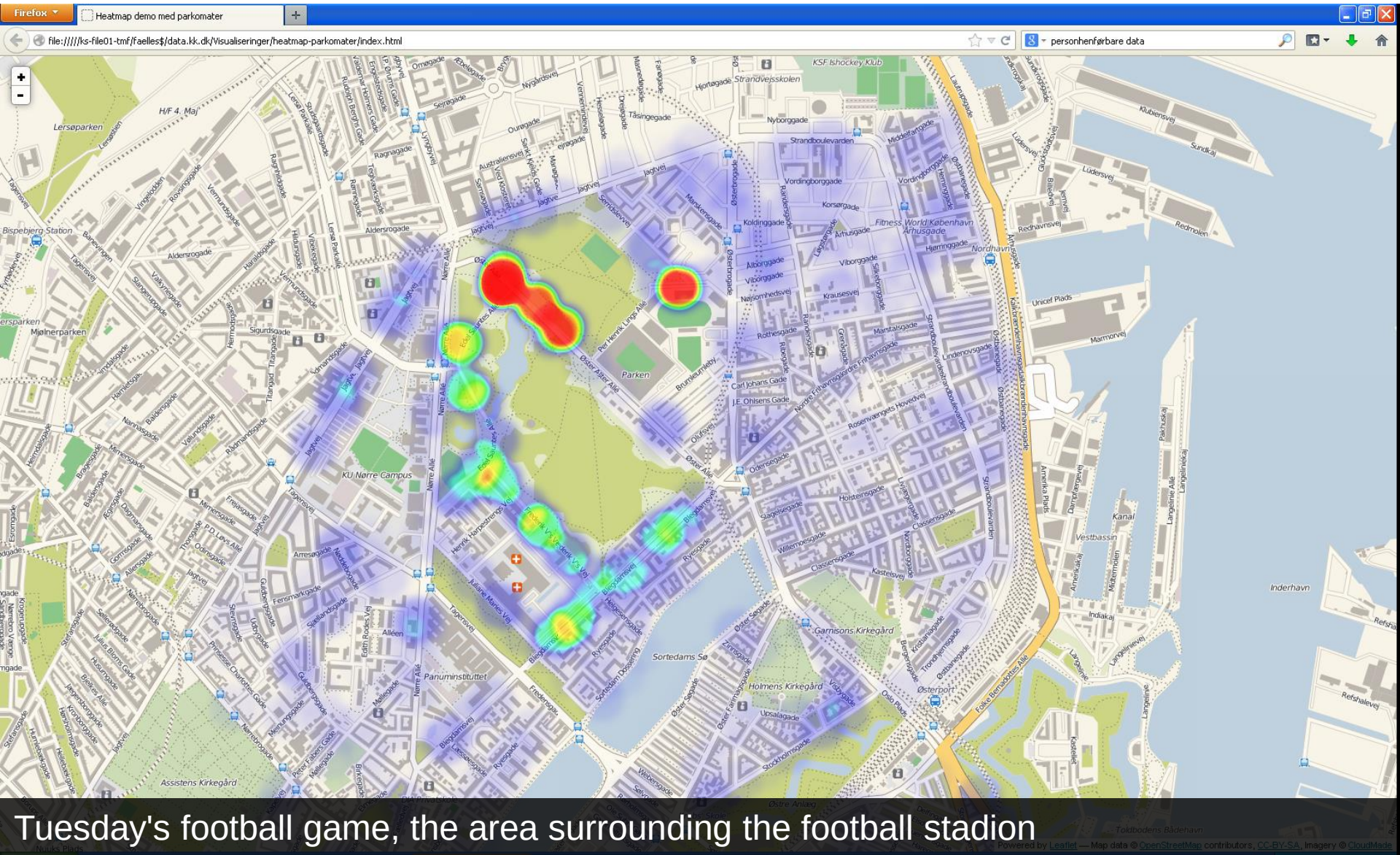
DONG energy

københavns

IMPROVE PUBLIC-PRIVATE PARTNERSHIPS
Coordinated urban development and infrastructure improvement, optimized resource usage etc.

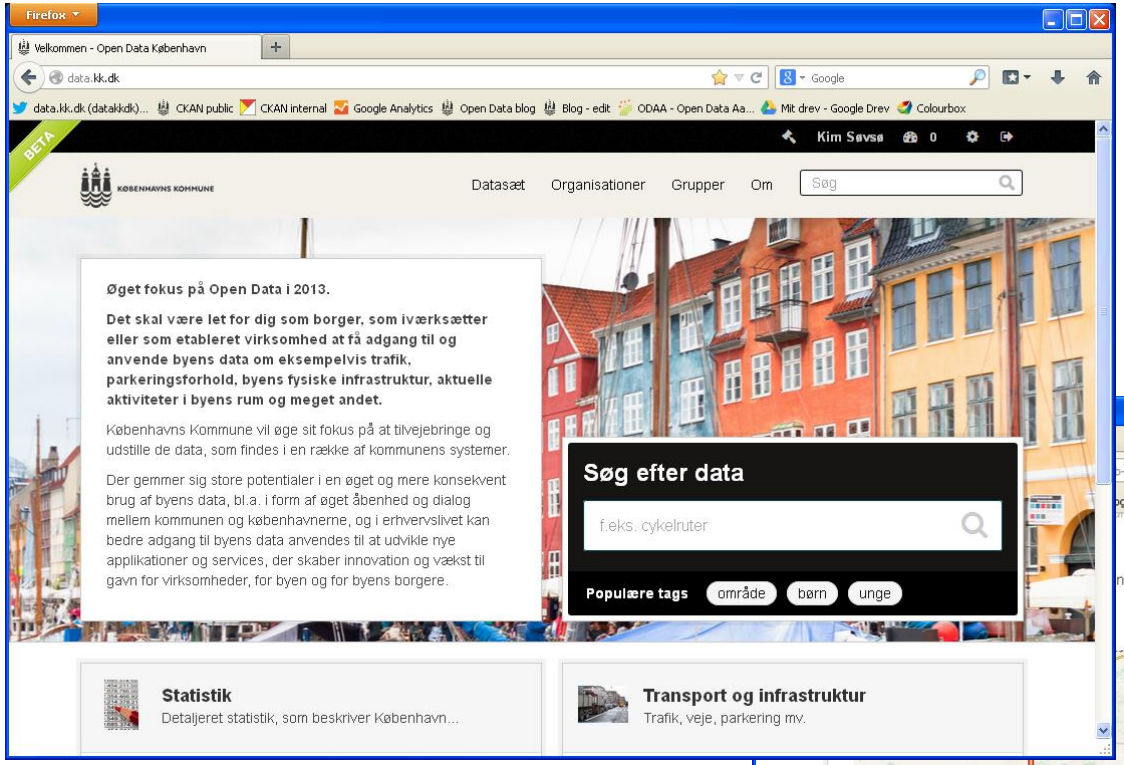
SUPPORT POLITICAL AND STRATEGIC INITIATIVES
Support green growth, innovation, sustainability, job creation, ITS, Smart City, green urban planning etc.

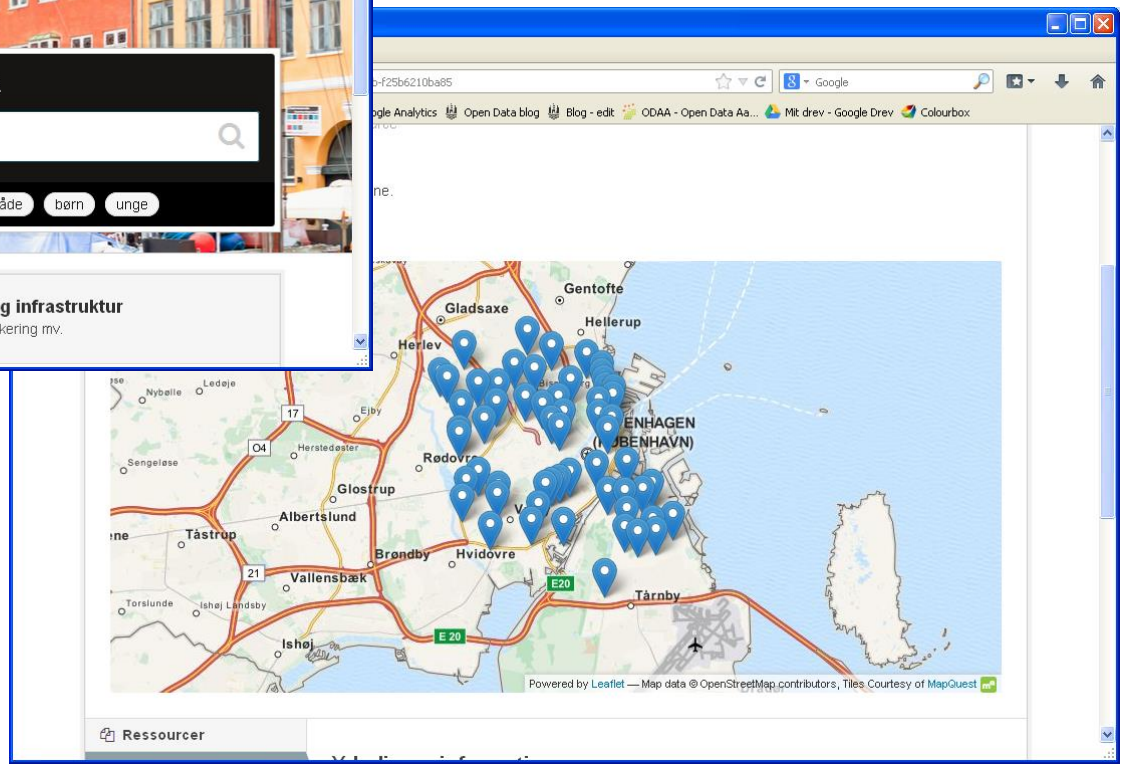
FCK playing Real Madrid tuesday 10. december 8 pm



Tuesday's football game, the area surrounding the football stadion

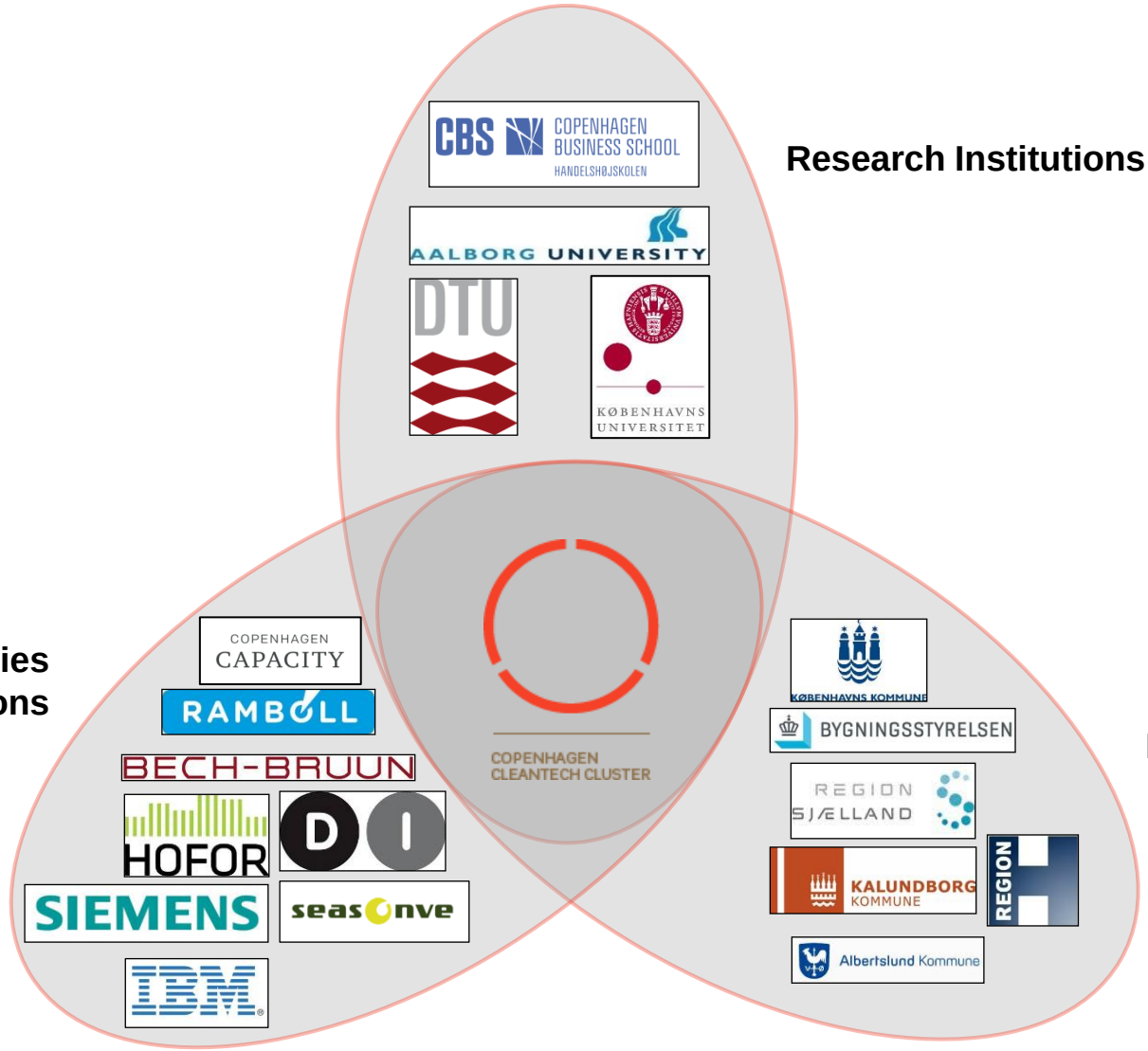
data.kk.dk


Firefox
Velkommen - Open Data København
data.kk.dk
BETA
Kim Søvsø
KØBENHAVNS KOMMUNE
Datasæt
Organisationer
Grupper
Om
Søg
Øget fokus på Open Data i 2013.
Det skal være let for dig som borger, som iværksætter eller som etableret virksomhed at få adgang til og anvende byens data om eksempelvis trafik, parkeringsforhold, byens fysiske infrastruktur, aktuelle aktiviteter i byens rum og meget andet.
Københavns Kommune vil øge sit fokus på at tilvejebringe og udstille de data, som findes i en række af kommunens systemer.
Der gemmer sig store potentialer i en øget og mere konsekvent brug af byens data, bl.a. i form af øget åbenhed og dialog mellem kommunen og københavnerne, og i erhvervslivet kan bedre adgang til byens data anvendes til at udvikle nye applikationer og services, der skaber innovation og vækst til gavn for virksomheder, for byen og for byens borgere.
Søg efter data
f.eks. cykelruter
Populære tags
område
børn
unge
Statistik
Detaljeret statistik, som beskriver København...
Transport og infrastruktur
Trafik, veje, parkering mv.


Gentofte
Gladsaxe
Hellerup
Herlev
Nybølle
Ledøje
Ejby
Sengeløse
Herstedøster
Rødovre
Glostrup
Albertslund
Tåstrup
Brøndby
Hvidovre
Vallensbæk
Torslunde
Ishøj Landsby
Ishøj
Tårnby
E20
E 20
17
O4
21
Powered by Leaflet — Map data © OpenStreetMap contributors, Tiles Courtesy of MapQuest
Ressourcer

Big data with partners

Founding Members Triple Helix

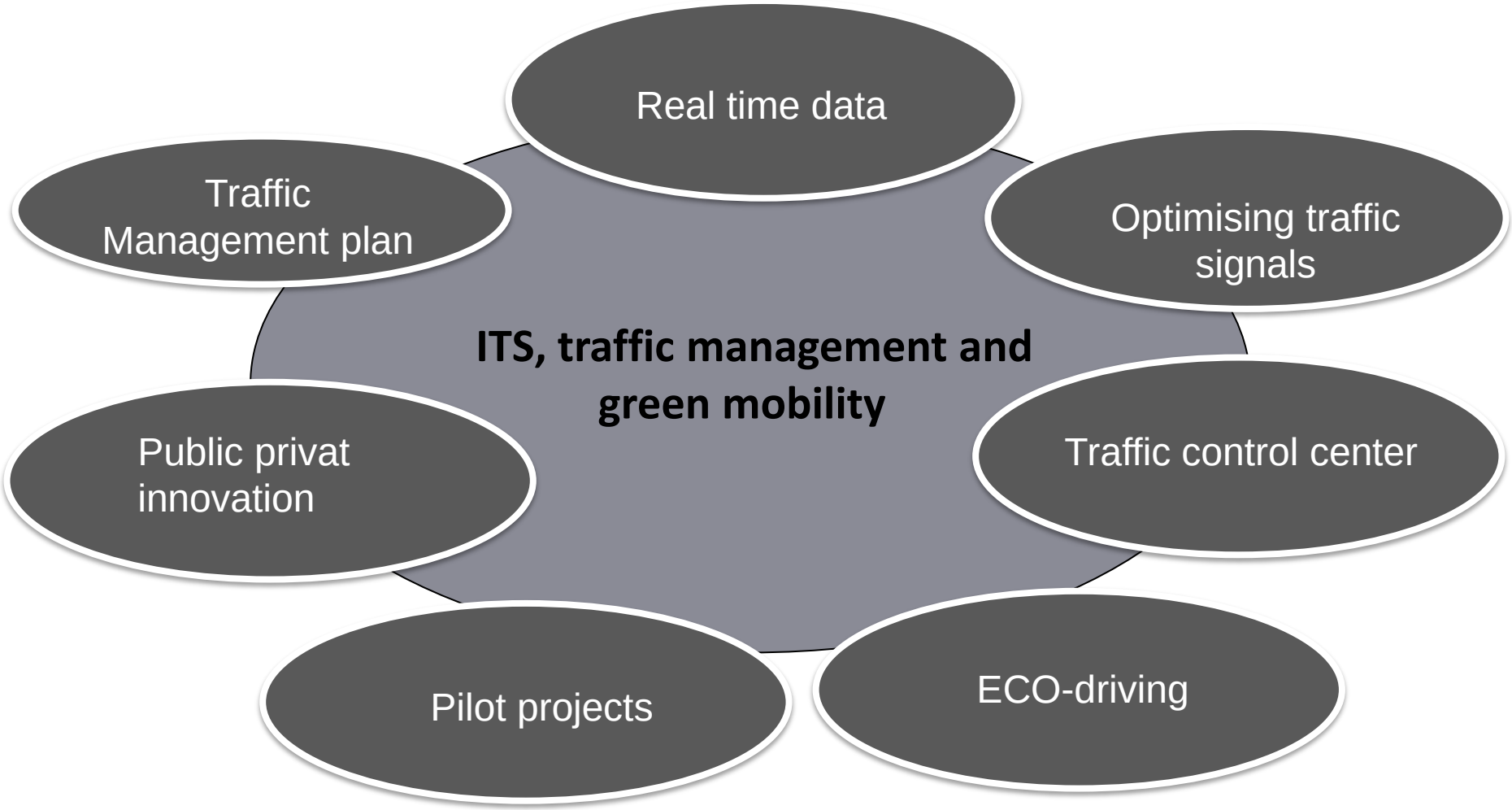


Big Data Platform

Objectives:

- Construct a digital platform which centralizes data from a range of public and private sources
- Develop new business markets through the digital platform
- Planning/solutions

Mobility projects and ITS



Cooperative systems

– COMPASS 4D and ECO-driving

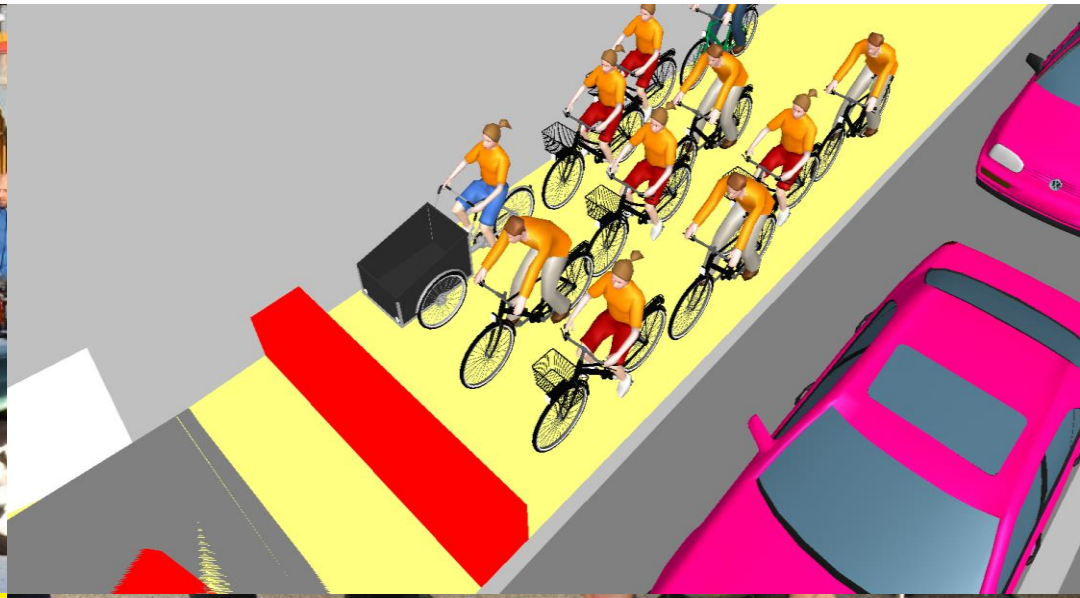
Communication between truck/bus and traffic controller

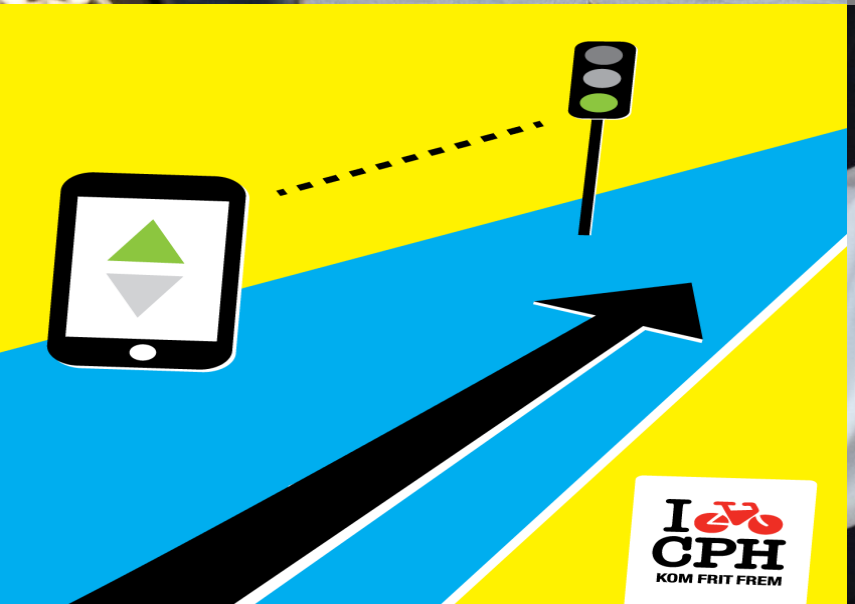
Connection indicator

Blue light and time indicator

Intelligent bus priority

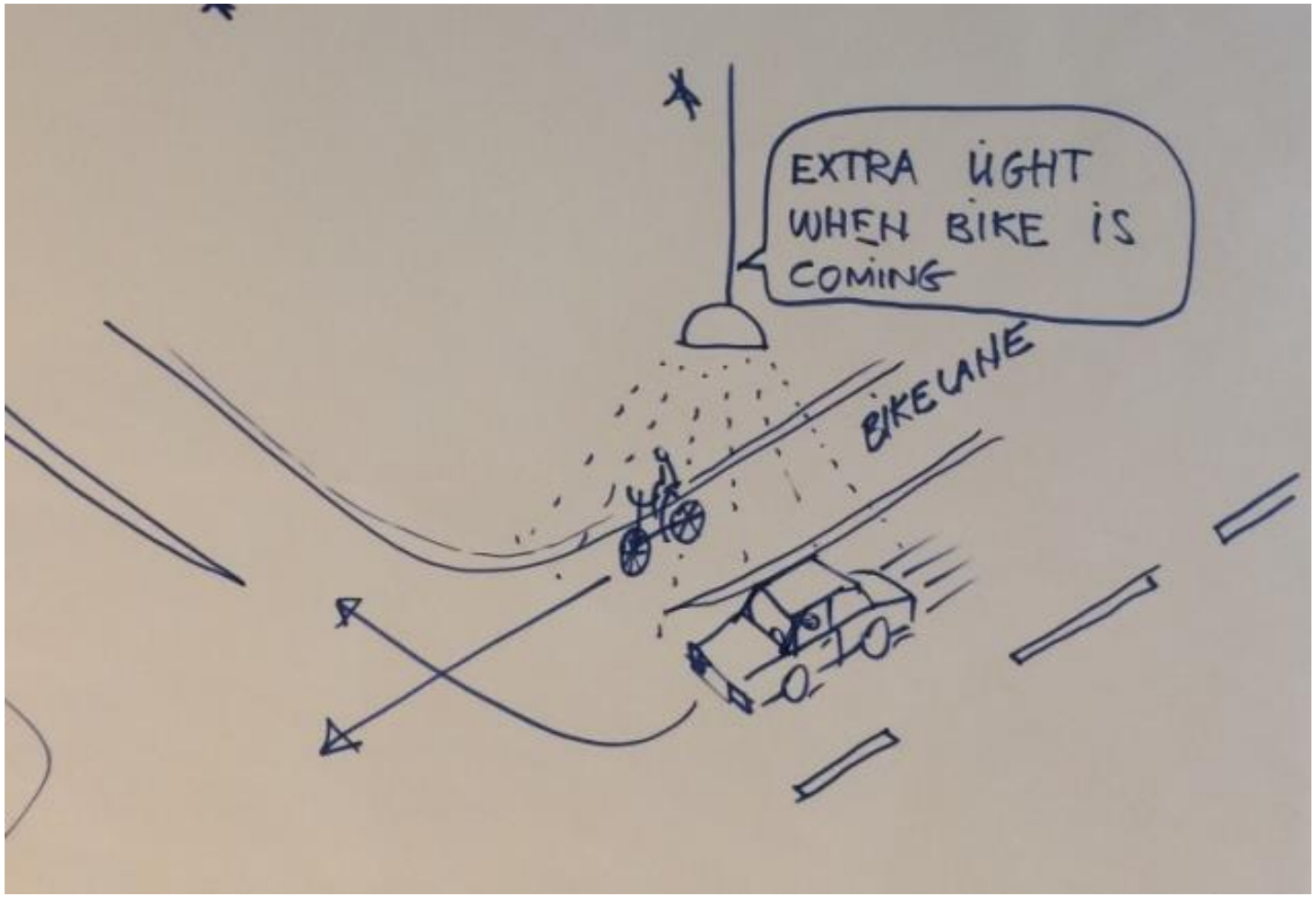
Pilot projects – bicycle ITS






Grøn bølge
Lige nu
18 km/t
Din fart
15 km/t

Intelligent lighting at intersections




CPH
Solutions
Lab

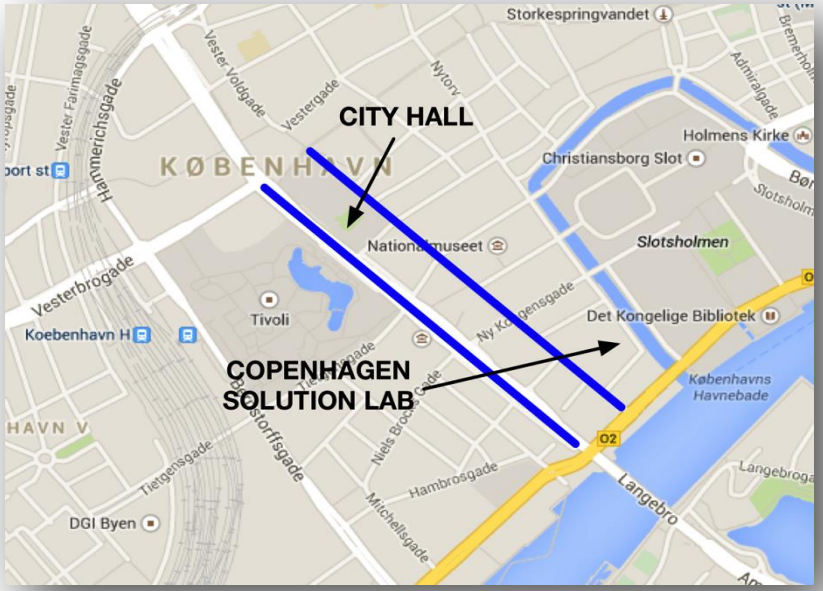
The vision for CSL

Copenhagen must offer a specific test environment for intelligent urban solutions where both large and small companies can demonstrate solutions and help to develop future green urban solutions in Copenhagen.

CSL must be a common meeting place for entrepreneurs, companies, knowledge institutions and citizens dealing with smart city and data-driven urban solutions.

Phase 1 project

- Inner City Zone for Urban Services based on workshop input from Municipality departments
- Known technologies, Waste management, Parking services, IoE & Wifi for tourism
- Copenhagen innovation focus
  - Water defenses
  - Traffic management



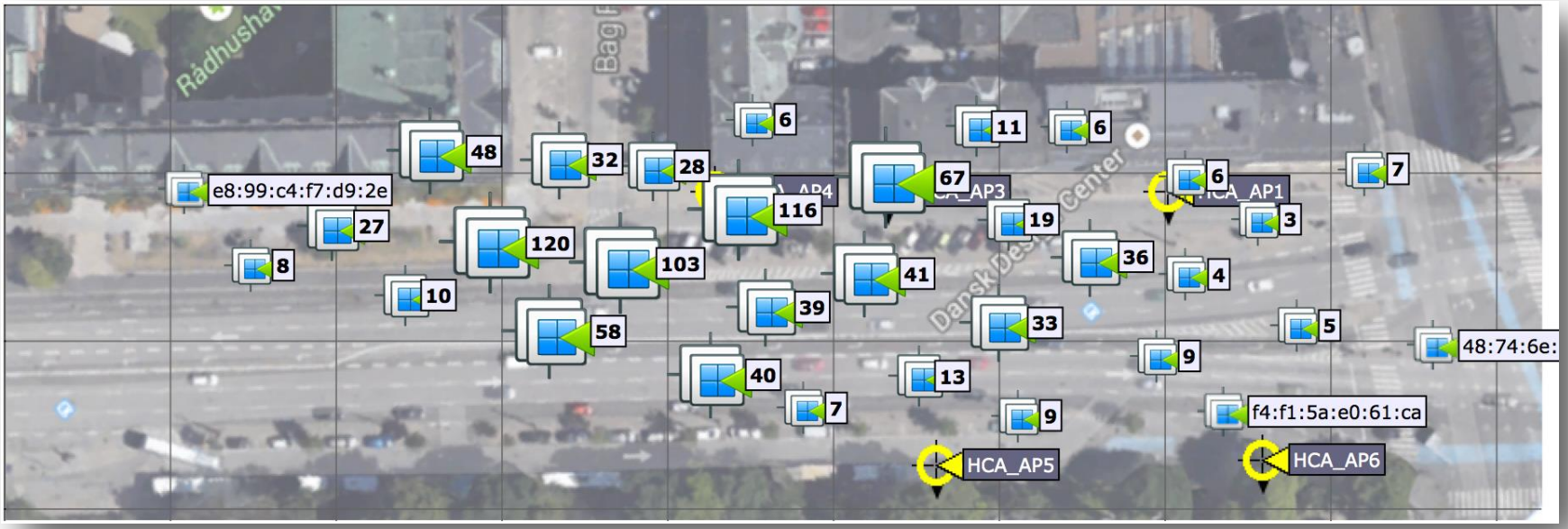
Water defences

Copenhagen Connecting

Innovation focus

- Accurate Measurement & Situational Awareness
- Decision-making Platform
- Rapid response across city services
- In collaboration with HOFOR

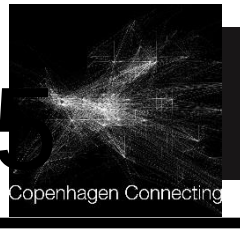
Traffic management



Innovation focus

- New ways of generating data for optimizing of traffic lights
- Chip based cost effective bike theft prevention & tracking of municipality's material
- Research from Technical University of Denmark: Space, Compute, Transport

Deliverables May / June 2015



Use Case		Definition
1	**City WiFi**	Build a city WiFi platform that can be used as a common infrastructure to support the City's smart services. After supporting and securing the city's smart solutions, additional capacity on the WiFi will be made available for limited public access for tourist services, healthcare & municipal use
2	**Smart Parking**	Smart parking solutions leverage sensors on parking spots, intelligent meters, and smartphone-based applications to enable drivers to quickly identify open parking spots, reducing congestion in key cities areas. Future advances on Smart Parking could include the ability to reserve a parking spot, as well as dynamic pricing of parking spots.
3	**Traffic Optimization**	Smart Traffic systems will leverage analytics available from the network (eg., routers, access points) as well as from other data sources to monitor real-time traffic conditions enabling real time decisions re: city signage and signaling. Trend data will also be used to inform long-term urban planning.
4	**Smart Water Defense**	Greater Copenhagen will explore ways to leverage the Smart City infrastructure (hybrid IoT city architecture, WiFi platform, data analytics, distributed sensors) to augment and assist ongoing water defense efforts under the Cloud Burst program. For instance, sensors in pumping stations can provide real-time insight into capacity availability, signage throughout the city can alert citizens of closures and dangers when flooding is possible. Copenhagen can leverage analytics from sensors through its water system to identify opportunities to maximize rainfall capture while ensure all rainwater during extreme events is directed to sewage treatment facilities and/or the ocean.
5	**Smart Waste**	Sensors in garbage bins send alerts when full to enable trucks to optimize their routes and prevent trips for empty bins. Sensors could also provide information on level of fullness to enable usage-based pricing. Finally, sensors could provide alerts when in-appropriate or hazardous material is thrown away.
6	**Establishment of Copenhagen Solutions Lab**	Copenhagen Solutions Lab will lead the implementation of innovation and smart city development in close collaboration with knowledge institutions and companies as well as citizens.

Let's build the infrastructure for the future!

Copenhagen Connecting

The vision of a trade town
Establishment of channels and harbor areas

The vision of the industrial city
Establishment of train lines, roads, cycle paths

The vision of a digital future
Establishment of visionary digital infrastructure

1700- | 1800- | 1900- | 2000- | 2013-

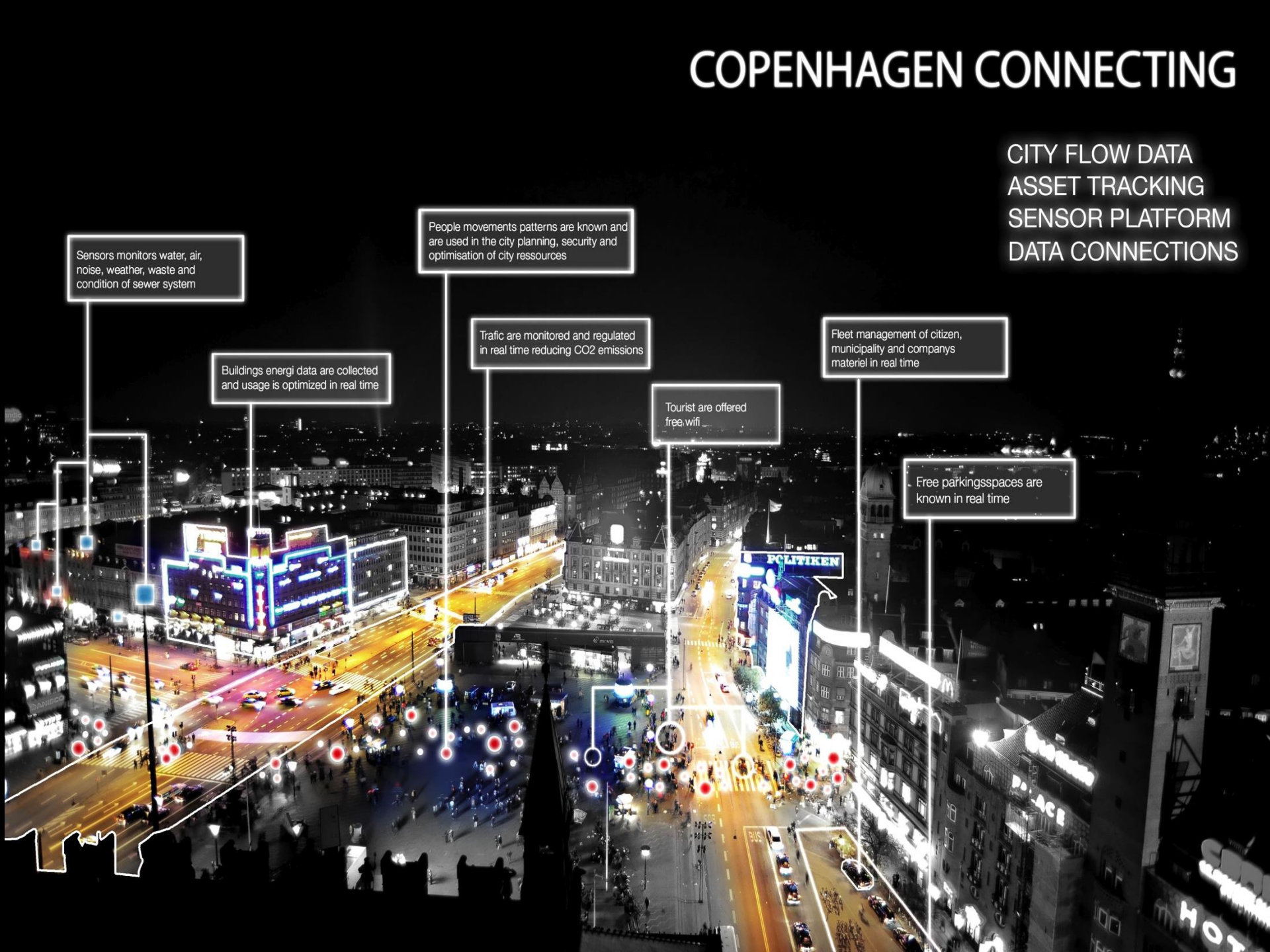
Copenhagen anno 1790
Leading the national and international trade through traffic

Copenhagen anno 1930
Leading the industry through mobility labor, goods and services

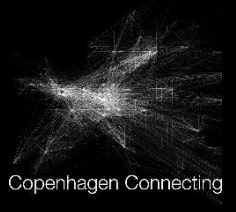
Copenhagen in 2020
Leader in green growth through data and innovative technology solutions

COPENHAGEN CONNECTING

CITY FLOW DATA
ASSET TRACKING
SENSOR PLATFORM
DATA CONNECTIONS



Core services enabled by Copenhagen City Grid



- Big Data city flow
  Data being collected from triangulated Wi-Fi devices creates knowledge about people movements, cars, bikes etc. throughout the city in real time and aggregated over time.

- Asset tracking
  Active and passive RFID tags enables tracking of equipments in the city using cost efficient compact wireless chip as an alternative to GPS

- Sensor platform
  Cheap, wireless, compact sensors creates data about the city condition in real time – driver for Internet Of Things.

- Cost efficient data connections
  Consolidation of data network infrastructure enables unified communication. Wifi covering the city can be offered to telecom industry to offload mobile networks

Big Data
City flow

Optimization of the traffic flow, knowledge of traffic jams and automatic actions to remedy the situation

Crowdcontrol at public events

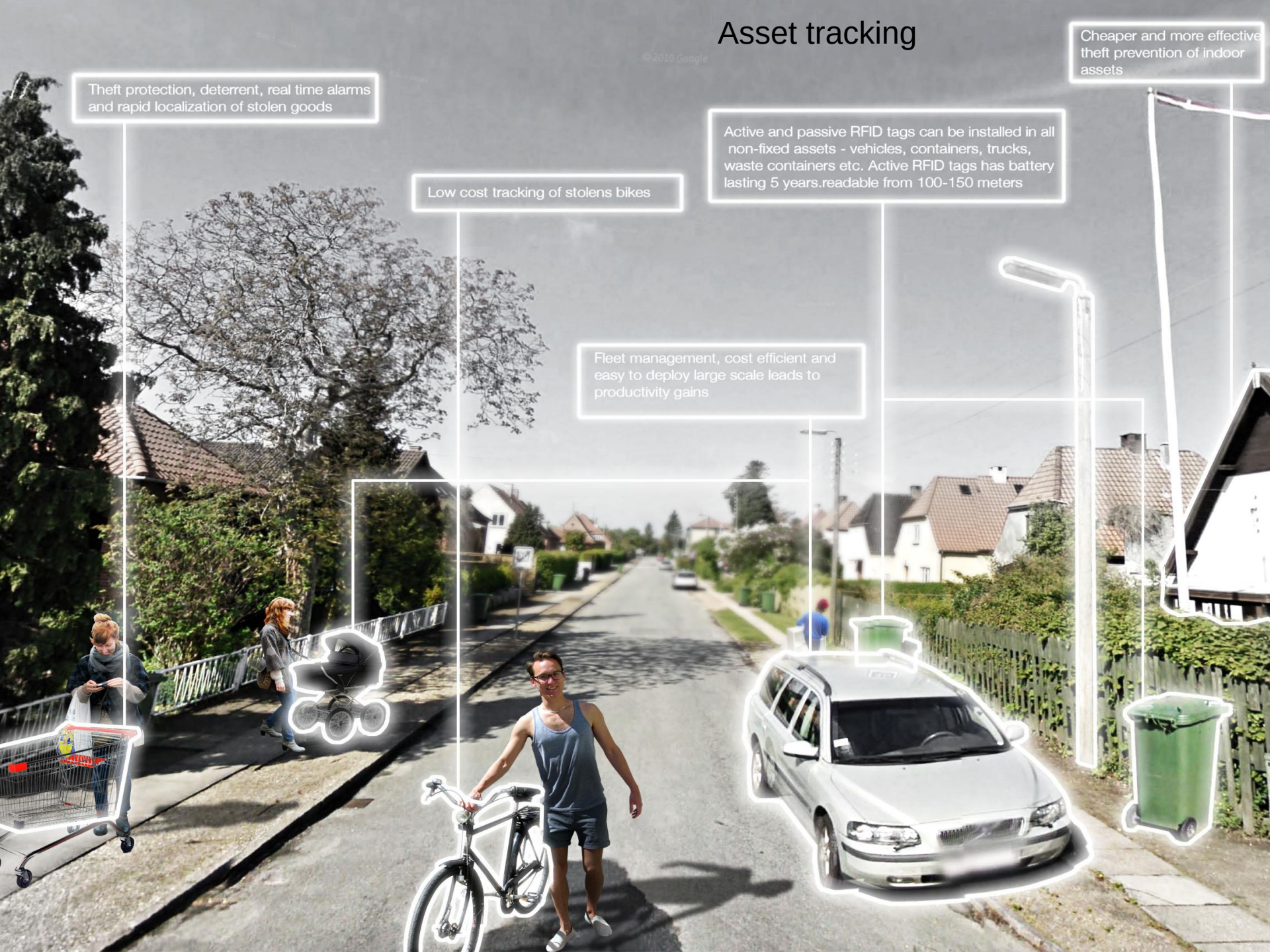
Emergency Management Ambulance on the way through town

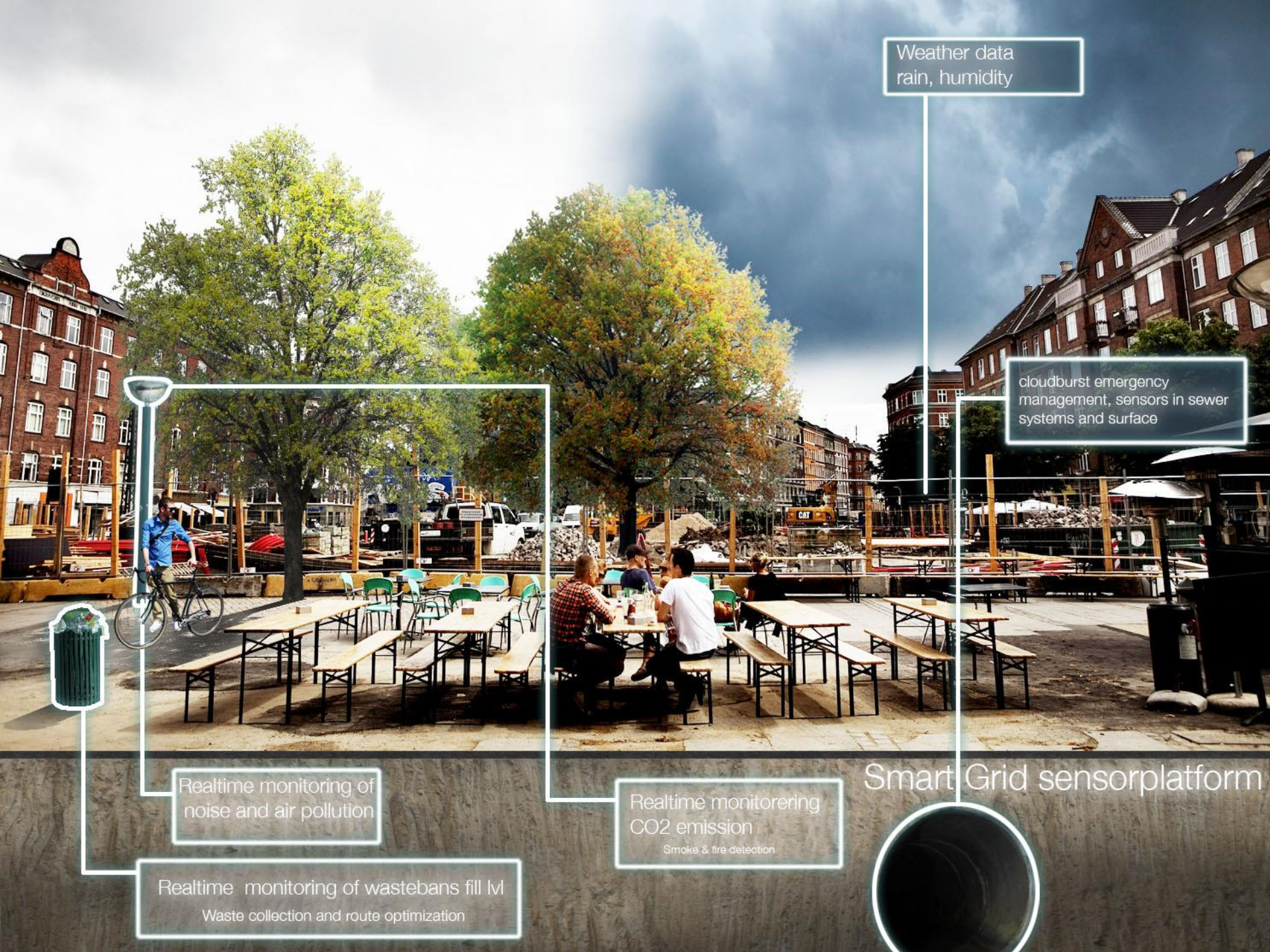
Delay in public transportation system alarms

Dynamic pricing of parking tariffs based on local traffic situation or availability of free parking spaces in area

Dynamic road pricing based on RFID tags which matches the actual use of roads

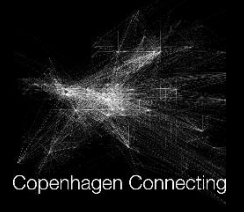
Asset tracking




Weather data
rain, humidity
cloudburst emergency management, sensors in sewer systems and surface
Realtime monitoring of noise and air pollution
Realtime monitorering CO2 emission
Smoke & fire detection
Realtime monitoring of wastebans fill lvl
Waste collection and route optimization
Smart Grid sensorplatform

Data offloading

Results from socioeconomic analysis



- Highlights:
- 11-32% optimized car traffic flow
- 2,4 million car hours saved
- 30,7 million driven kilometers saved 1.7 million L fuel reduction
- 5.5 million m3 water consumption reduction
- 180.000 ton CO2 emission reduction
- 50% reduction in bike thefts
- An increase in tourism by 1%
- Job creation €104 million
- Vulnerable citizens - kids and people suffering from dementia €28 million

RAMBØLL

Results from socioeconomic analysis

Copenhagen Connecting

Tabel 1: CC's samlede potentielle gevinster 2013 (mio. kr.)

Analyseområde	Estimerede gevinster, MIO. DKK (2013 pl)
ITS – Transport, parkering mv.	1.756
Miljømålinger, luft, støj	832[1]
Vand	199
Affald	1
ICT og Smart Grids	382
Innovation og vækst	775
WiFi-opkobling til turister	31
Sikkerhed	80
Asset tracking	195
Sikring af udsatte borgere	128[2]
Telesundhed	4
Samlet	**4.383**
Data kommunikation i Københavns Kommune	Potentialer – som dog i indeværende analysedesign ikke er estimeret kvantitativt.
Mobile Networks offloading	

Note: De samfundsøkonomiske gevinster vedrører både Københavns og Frederiksberg Kommune.

1. Da dette er baseret på forøgelser af boligværdien i København og Frederiksberg Kommune kan denne gevinst kun realiseres én gang.
2. Endelige gevinster er ikke opgjort, oplysninger fra Københavns Politi udestår.

Tabel 39: Kommunale gevinster ved et MAN i Københavns Kommune (mio. kr. per år)

	København
Netværk, tele- og datakommunikation	95,4

Kilde: Københavns Kommune, Cisco, egne beregninger

Tabel 40: Samfundsøkonomiske gevinster ved et MAN i Københavns Kommune (mio. kr. per år)

	København
Netværk, tele- og datakommunikation	19,1

RAMBØLL

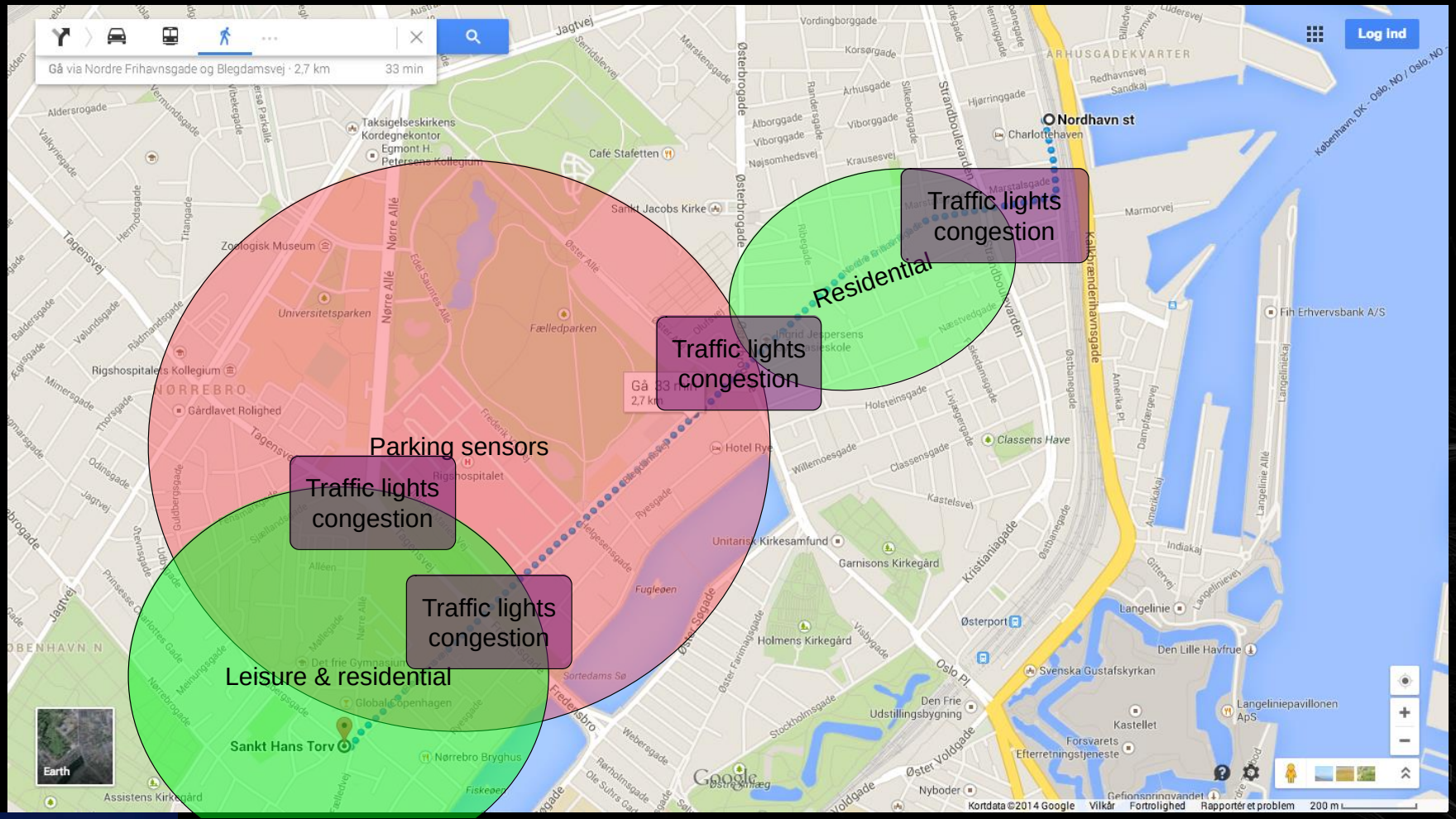
Copenhagen Connecting supports the city's adopted strategies – examples

KBH 2025 Klimaplanen	Øget reduktion af CO_2-udledning eksempelvis gennem effektiv udnyttelse af 'Big Data' i trafiklysregulering, ruteoptimering af kommunens egen bilflåde, lavere søgetrafik efter ledige p-pladser og energioptimering af bygninger.
Skybrudsplan	Varsling af skybrud via opsamling af data, således at underjordiske overløbsdepoter bedre kan styres og skader forebygges.
Handlingsplan Grøn mobilitet	Intelligent trafikstyring hvor brug af 'Big Data' kan anvendes til bedre afvikling af trafiklysregulering i form af grønne bølger, eco-driving m.v.
Cykelstrategi 2011-2025	Billig chipteknologi minimerer cykeltyveri, forbedrer ruteplanlægning for cyklister og giver mulighed for bydækkende prioritering af cykeltrafik over biltrafik.
Parkerings-strategi	Søgetrafikken efter ledige p-pladser minimeres og muligheder skabes for optimering af kontrol.
Ressource og Affaldsplan 2018	Ressourcebesparende og mere CO_2-venlig affaldsindsamling, der optimerer driften og planlægningen ved brug af 'Big Data' og brug af sensorer på eksempelvis skraldespande og mobilt materiel i byrummet.
Kommune-planen	Ved at udnytte 'Big Data' om bevægelsesmønstre m.v. skabes der et bedre beslutningsgrundlag og dermed grobund for byplanlægning, der understøtter byens behov.
IT-strategi 2010-14	Konsolidering af netværksinfrastruktur i KK, hurtigere og billigere dataforbindelser, samt IP-telefoni til kommunen.
Smart city, 7 dir beslutning 2012, Open data strategi	Udstilling af offentlige data, skabe en platform for vækst, inddragelse af borgere og virksomheder i udvikling af velfærds- og Cleantech-løsninger i stor skala.


Ruteplanlægning
Wifi til turister med en indgang til KBH
Realtidsdata fra sensorplatformen
Filter route by:
- pollution
- noise
- fastest
- weather
- events
- roadwork
- fastest

The area – Skt. Torv to Nordhavn

Copenhagen Connecting



Copenhagen Smart City

Copenhagen Connecting