



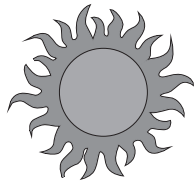
**TUPex
iNELS**

Smart Street Lighting

Economical and effective outdoor lighting solutions

www.tupex.se

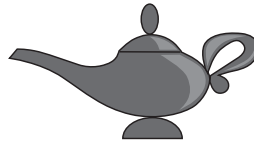
Brief history of lighting



Here comes the sun



Getting hot in here



Where magic starts



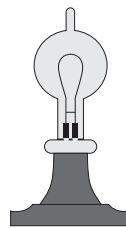
So do the fairytales



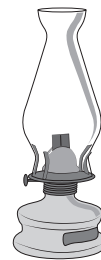
First light bulb hooray!



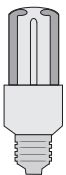
And first street lighting



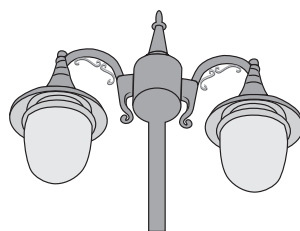
Like the electricity



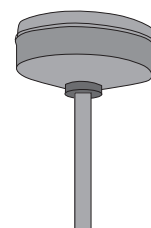
And many stories...



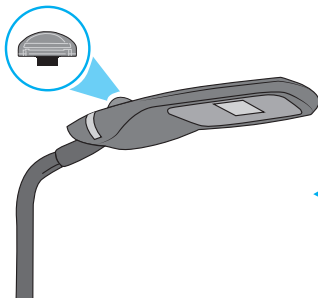
Then the first which supposedly saving energy



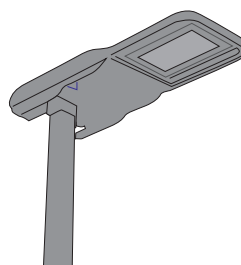
Visible everywhere worldwide



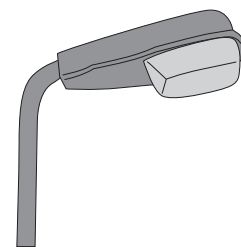
Old, but not so bad...



Finally, Smart lights are here!



First LED lights



Valve time!

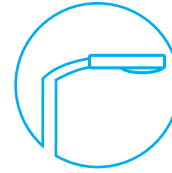
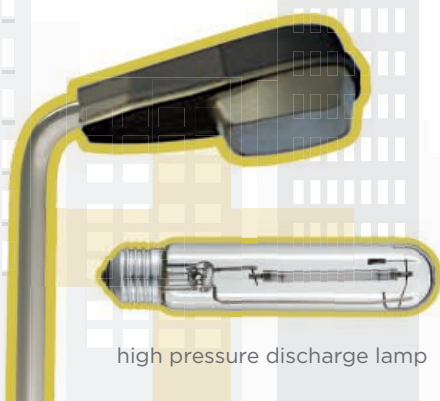
Public lighting

Public lighting is an essential component of the services for residents in any city or village. It helps facilitate people's movement and orientation and contributes to greater security. But what if the lamps in the streets could work a little differently? What if they could be much smarter? Smart lighting by our design are not just meant to shine. He can think through the light. It can regu-

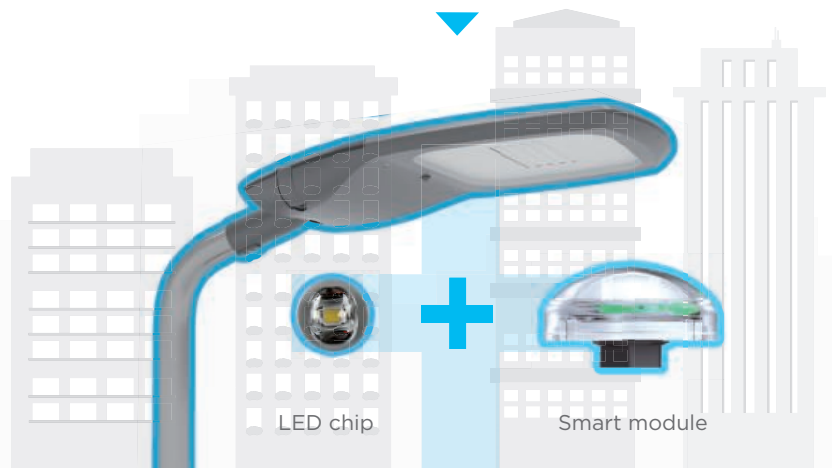
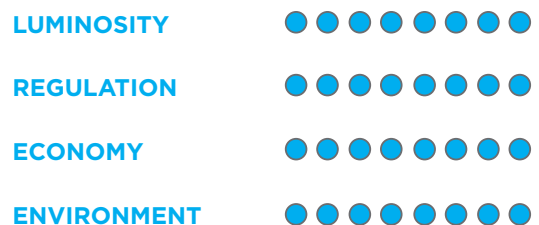
late the intensity of light based on the time of day, the ambient light and traffic density. In the event of a fault, it can transmit information required for repairs. Masts can serve as a conduit for additional sensors, detectors, weather stations, Wi-Fi signal transmitters, or security keys.



STANDARD STREET LIGHTING



SMART STREET LIGHTING



Saving analysis

| Lighting source | 250W high pressure sodium | 110W LED street lights |
|--------------------------|---------------------------|------------------------|
| Number of sources | 10 000 | |
| Lighting time in a day | 12 | |
| Lighting days in a year | 365 | |
| Daily Power consumption | 36 700 KWh | 14 100 kWh |
| Annual Power Consumption | 13 402 800 kWh | 5 160 100 kWh |
| Daily Electricity Fee | 4 840 Eur | 1 860 Eur |
| Annual Electricity Fee | 1 760 850 Eur | 681 020 Eur |

| 110W LED Street Light with Smart Street Lighting Control System | |
|---|---|
| Energy Saving Mode | Dimmable Energy Saving |
| Strategy | Dimming The Light According to the 12 hrs of Lighting |
| Energy Saving Mode | 30% |
| Total Energy Saving Rate | 73,04% |
| Annual charge after reconstruction | 476,890 Eur |

What are the benefits of smart lighting?



High flexibility

Smart lighting is able to promptly communicate with the control unit, to react and adapt to the light intensity.



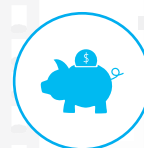
Environment

By reducing the energy consumed by lighting we are able to greatly reduce the impact on nature and the environment.



Easy installation

Upgrading your existing lighting to smart is not at all that challenging. According to the scope of change it is just a matter of a few days.



Economical

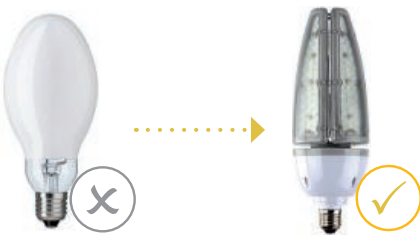
Thanks to the use of modern LED lights, it is possible to save a lot of the operating costs each year for the operation of each smart lamp.

Retrofit options

How can we deal with the renewal of public lighting? Let's describe the basic options and how much it will cost us. It is necessary to say that in the case of re-

newal of public lighting it is an investment for several decades. As in normal cases, the cheapest solution at the beginning is not usually so in the long-term.

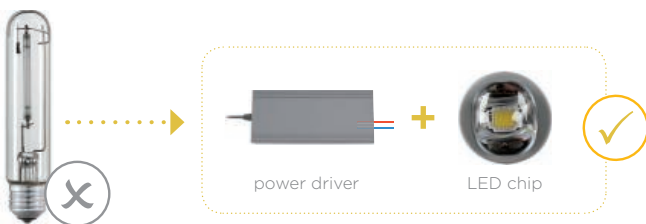
1 „Corn“



- Replacement of old light sources (high pressure sodium) after LED lights called „Corn“.
- Price of revitalization of one light point: **50 EUR***.

This solution is very simple and inexpensive but has one major drawback. Troublesome cooling reduces significantly the life and luminous efficacy of the LED light.

2 LED light source retrofit



- Replacement of a part of the luminaire with new ones (e.g. high pressure sodium lamps).
- The revitalization price of one light spot: **150 EUR***.

Again a relatively easy solution. The question remains, however, whether there is a suitable and especially high-quality retrofit for you. Here, too, we encounter troublesome cooling problems.

3 Replacement lighting fixture



- Replace old lights fixtures with new ones.
- The price of revitalization of one light spot:
 - high quality LED - **200 EUR***.

Complete replacement of the luminaires brings higher costs, but it will certainly pay off, ideally combining the replacement of luminaires with the installation of smart drivers.

4 Smart Street Lamp



- Complete replacement of public lighting including masts, wiring and lights.
- Price of revitalization of one light spot: **250 EUR***.

We recommend this option for installations older than 30 years. With new luminaires it is always wise to add smart control. We supply our modules directly in the luminaires or as an external device.

* The prices above not include: installation, column and accessories.

SSL controllers

For smart lighting to function correctly, the light fitting must be equipped with a communication module. Modules differ in design, installation, and communication network, but their function is always the same. For communication, wireless LPWAN networks, especially **LoRa** and **NB-IoT**, should be used (see page 10 for

more details). They allow **two-way** communication - they can not only control but also receive information from the light fittings. This is conditional on the availability of a given network with sufficient signal at the point where the light fittings are located. Signal quality can be determined by a special signal strength indicator.

Retrofit modul

Retrofit



Outdoor design for retrofits, placement externally on the body of the light, mast or base.



AirSLC-100L
AirSLC-100Nb

- **Outputs:**
0(1) - 10V DC / 10 mA
- **Connection:** wire outlets
- **Power supply:** 110 - 230 V AC
- **Dimensions:**
 - 182 x 62 x 34 with antenna
 - 96 x 62 x 34 without antenna
- **Communication:** LoRa/NB-IoT
- **Antenna:** included

PLUG-IN (socket)

Plug



Receiver actuator in a special box with a bayonet connector for easy installation into lights equipped with this socket.

AirSLC-100/LWES



Power supply: 12-24 V DC
Output: 0 (1)-10 V (20 mA) DALI
Communication: LoRa/NB-IoT
Dimensions: Ø 80 x 34 mm

AirSLC-100/NEMA



Power supply: AC 100-230 V AC
Output: 0 (1)-10 V DALI
Communication: LoRa/NB-IoT
Dimensions: 84 x 98 mm

OEM (built-in) - Embedded

Embedded



PCB board for direct integration into the power supply board.



LoRaWAN Modul OEM (OEM)

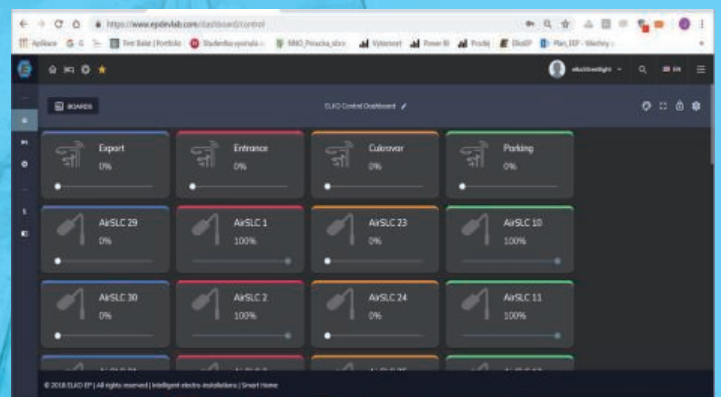
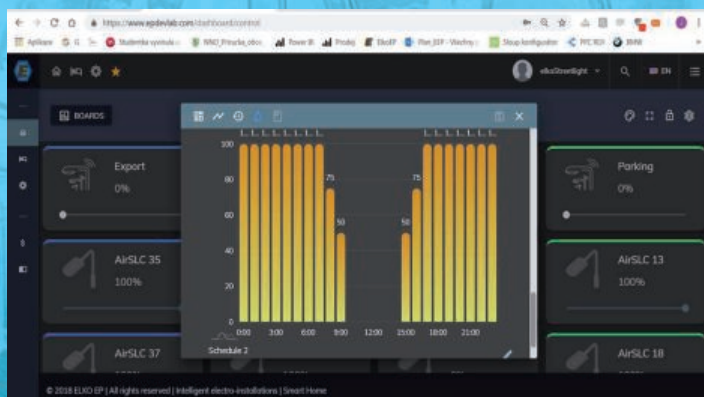
- **Connection:** soldering pins
- **Power supply:** 5-24VDC, after breaking source parts only stabilized 3V3 / 140mAh
- **Dimensions:**
 - 19.5 x 46.1 (33.8)* x 4 mm with ULF connector
 - 119.5 x 57 (44.7)* x 7 mm with SMA connector
 - 19.5 x 46.1 (33.8)* x 21 mm with internal antenna
- * dimension after breaking the source section
- **Gain:** + 2,12 dB
- **Communication:** LoRa 868Mhz
- **Antenna:** external ULF or SMA connector, internal bent parts of the product

Smart street lighting platform (SSLP)





All smart street lights are connected to Smart city platform wirelessly. It gives you an easy way how to control and monitor all the lights in the city.



- **USER FRIENDLY PLATFORM**
on your computer or laptop
- **EFFECTIVE REPORTING TOOLS**
graphs, data and saving analysis
- **PREDEFINED SETTINGS**
for easy and smart lighting and energy savings
- **ADVANCED DIMMING**
scheduled dimming
- **GPS DETECTION**
faster way how to find a defect on the lights
- **SECURITY**
with proper and safe authorization
- **COST REDUCTIONS**
with new working management
- **READY FOR IoT**
it is connectively ready
- **WIRELESS SOLUTION**
easy to upgrade whenever you want



Network comparison

| Items | LoRa | NB-IoT | GPRS | ZIGBEE |
|------------------------|---|---|--|--|
| |     | | | |
| Frequency band | 470/868/915 MHz | 800/900/1800 MHz | 850/900/1800 MHz | 470M/868M/915M/2.4 G Hz |
| Communication distance | 10-15 km ideally 1-5 km urban rare | 15 km | Unlimited | Node to Node: 150M |
| Communication speed | 0,2 37,5 Kbps | 65 Kbps | 115K bps | 250 Kbps |
| Advantage | Good security Good anti-interference, low power consumption, low maintenance Wlan, multi-connections, free frequency | good security, good anti-interference, low power consumption, low maintenance, Wlan | Good security, good anti-interference, short time of accessing, low power consumption, low maintenance, high speed of comm | Auto-mesh, high common speed |
| Disadvantage | Low speed of communication, max connection 500-1000 node, long distance | High price, NB-IoT network, public frequency | Data loss | Interferred by other radio, max. connections only 255 nodes, comm distance short |

Principle of function



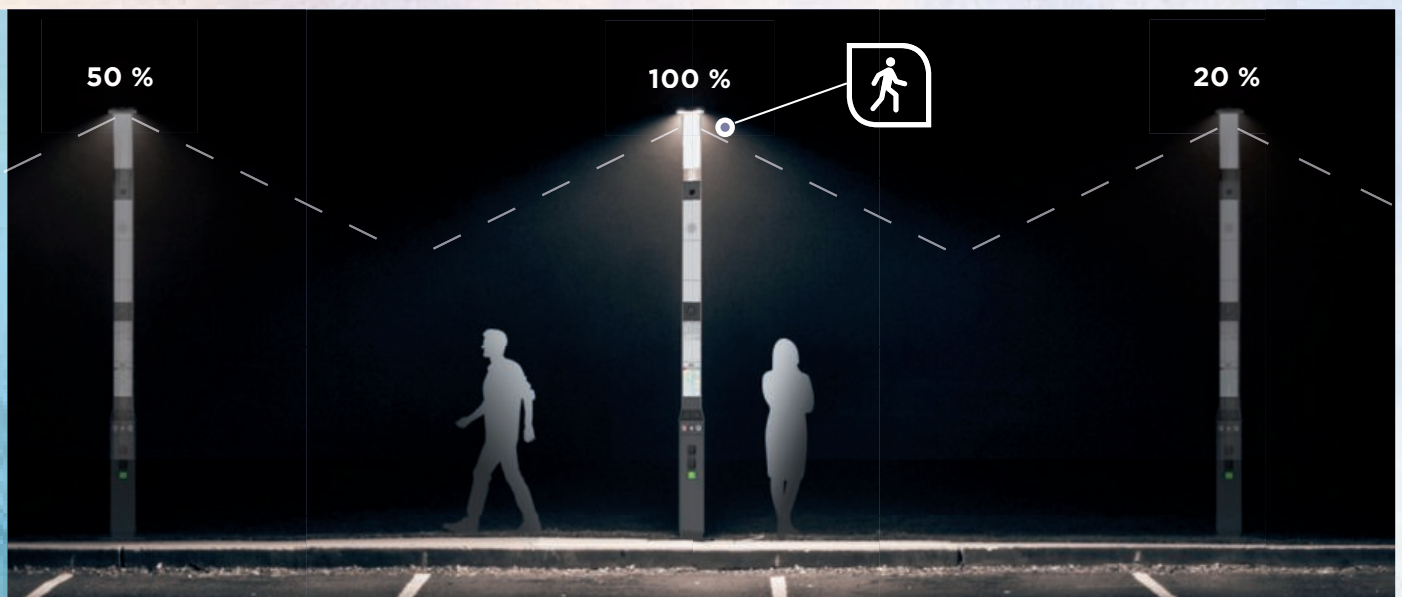
The main component of the infrastructure is the LoRA/NB-IoT LPWAN network that provides connectivity for IoT devices in Smart City. BTS (Base Transceiver Station) receives commands from the backend server and sends them wirelessly to the individual light actuators. They process and execute the command (ON/OFF or the desired brightness setting).

The actuators are also equipped with sensors that detect the ambient parameters or input activation and send this information via the BTS back to the server, which evaluates, displays and can trigger the appropriate action.

Smart pole

In every big city we can find thousands today, sometimes even tens of thousands of public lighting poles. We can use this dense network to install sensors or security cameras, and thus increase security for the population. We gain information about the number of people or vehicles, we can evaluate the air qual-

ity or the noise level, inform the inhabitants about the status of transport and parking places. Poles can also be used for Wi-Fi signals or recharging stations. So we have absolutely unlimited possibilities to work with smart lighting, and it's up to the investor to improve the quality of life in the city.

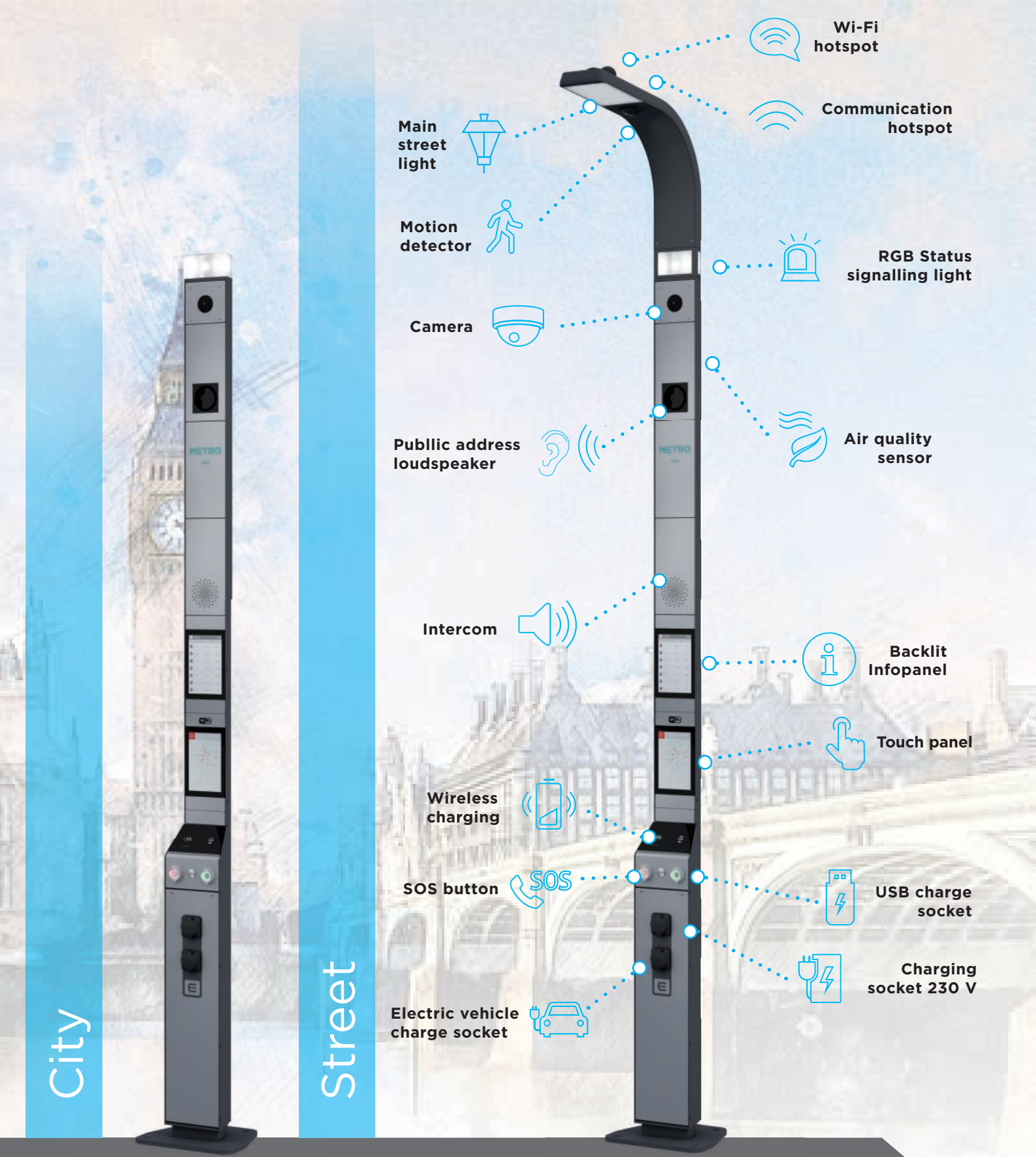


Charger



Kiosk





- Wi-Fi hotspot
- Communication hotspot
- Main street light
- Motion detector
- RGB Status signalling light
- Camera
- Public address loudspeaker
- Air quality sensor
- Intercom
- Backlit Infopanel
- Touch panel
- Wireless charging
- SOS button
- USB charge socket
- Charging socket 230 V
- Electric vehicle charge socket

City

Street

Pole setup



Wi-Fi Hotspot

Connecting to the Internet becomes a public and an easily accessible property. Any Wi-Fi signal from our transmitter will flow through every smart pole.



Public Address Loudspeaker

Warnings, reports. With this built-in speaker you will never miss any important information.



Wireless charger

Let you charge your mobile phone while you are waiting for a bus. The wireless charger will take care of everything.



SOS button

Are you in real trouble and need help? One push of this button will tell the rescue services that something is wrong.



RGB Status Signalling Light

The smart pole determines when it needs to be repaired. One of three colors indicates the status of the device.



Camera

The basis of security in each city is a system of security cameras that monitor the streets.



Touch panel

Touch panel to find the information you need. It includes, for example, a clear map of the city.



USB charge socket

There is also a universal USB charger to connect to any device or appliance.



Motion detector

The sensor built into the body of the pole serves to detect the movement of people around you. This switches on the light only if it is really needed.



Electric vehicle charge socket

The time of electric cars is knocking on the door. Charging ahead of the long journey has never been easier than with our iNELS pole.





Air quality sensor

Smart sensors are the basic means for collecting and evaluating information. This will greatly contribute to improving air quality in cities.



Communication hotspot

This device receives signals from sensors that control public lighting. Increases efficiency and cost savings.



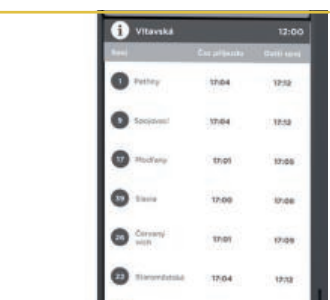
Charging socket 230V

The classic socket, as we know it, for moments when you just need a good dose of electricity.



Socket 22 kW

The 22kW charging station is also suitable for outdoor environments. It charges up to 10 times faster.

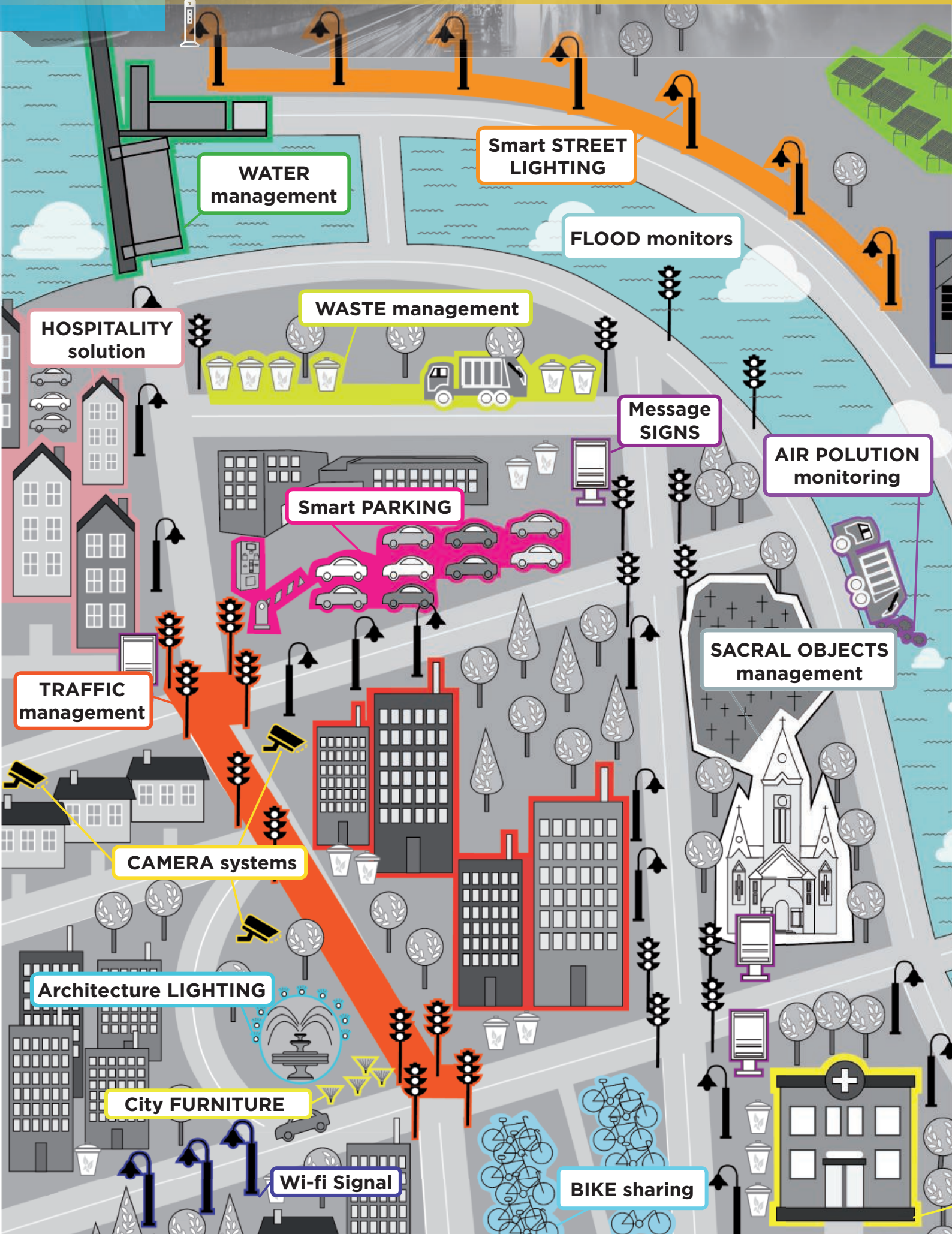


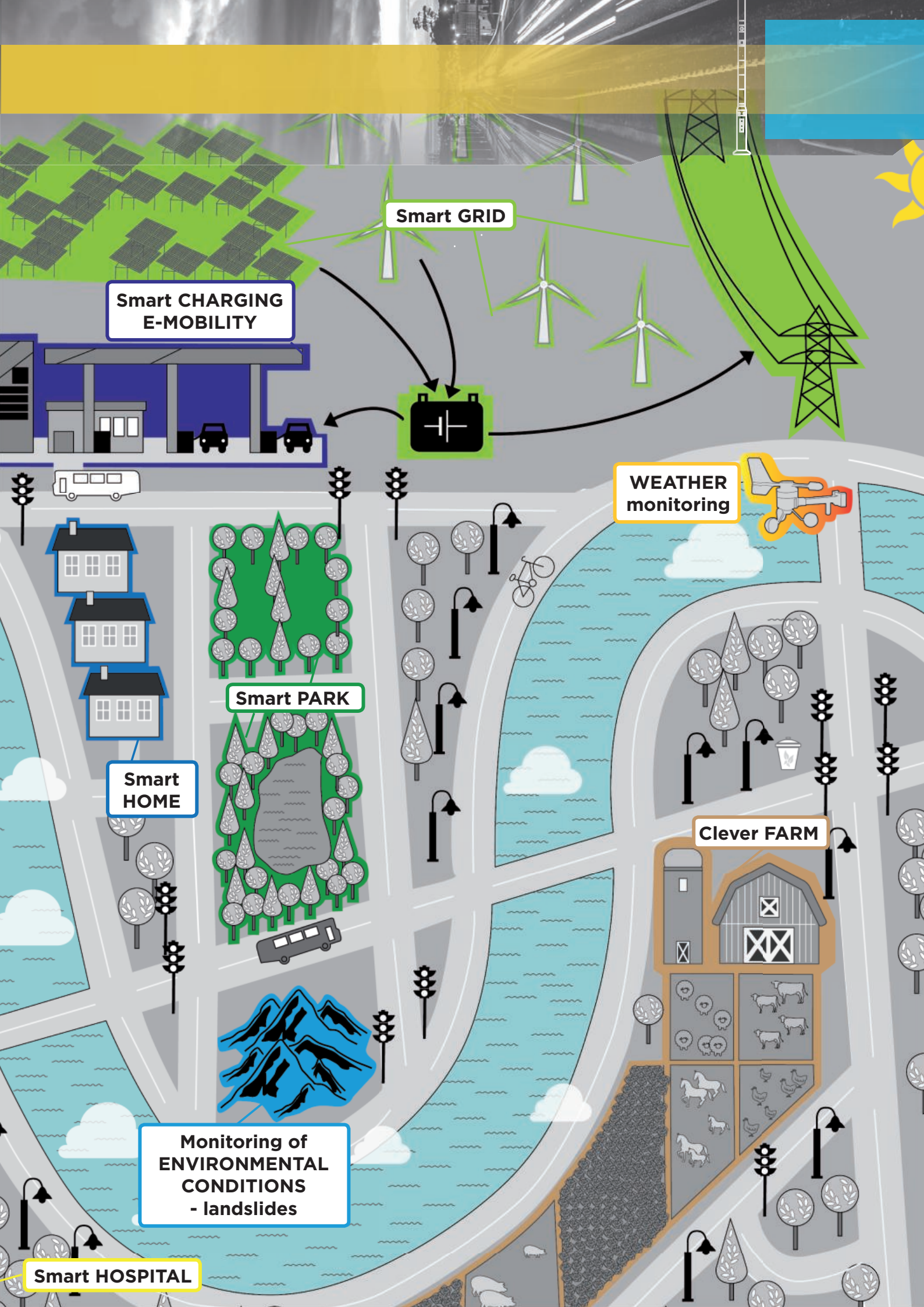
Backlit infopanel

Do you want to get rid of unnecessary street signs? That's why we have a panel where you can place the name of the street on which the lamp is located.



Smart city





Smart GRID

Smart CHARGING
E-MOBILITY

WEATHER
monitoring

Smart PARK

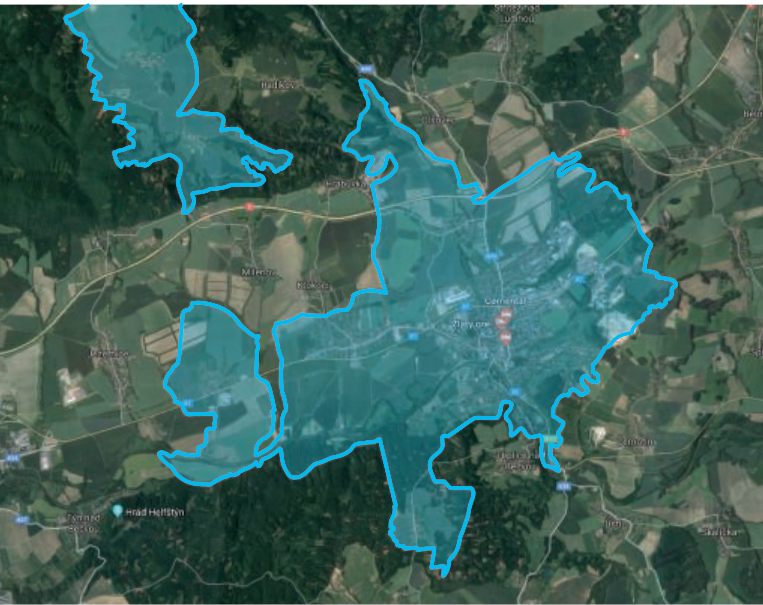
Smart
HOME

Clever FARM

Monitoring of
ENVIRONMENTAL
CONDITIONS
- landslides

Smart HOSPITAL

Hranice town



Location: Hranice, Czech Republic

Investor: Ekoltes Hranice, a.s., city company

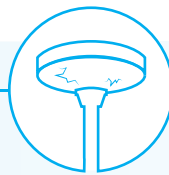
Suppliers:

Elektro-Lumen s.r.o. Hranice - lights, poles

ELKO EP, s.r.o. - control technology

Solution:

BTS broadcasting stations, monitoring and controlling products, IoT platform



BEFORE

14 892
kWh

power consumption

2000 K

chromacity temperature

170 W

output

X

brightness control

The original public lighting in this area was equipped with discharge lamps with sodium sources. This solution had a number of negative aspects, including inter alia higher electricity consumption. Not only that the sodium lamps themselves are consuming a lot of energy, the lights were also lit all night. This is often unnecessary, especially in the morning. Lighting controls were implemented using a twilight switch. The lighting circuit was switched on via the power control in the switchboard. But it was not able to respond adequately.



Case study



AFTER



4 327
kWh

power consumption

4 000 K

chromacity temperature

59 W

output

0-100 %

brightness control



The new lights saves electricity by using more energy-efficient LED light sources and it is also set to reduce the lighting intensity by use of the time program. This can be changed at any time by the software that can also be set and configured. Of course the lamps are divided into groups, but you can control each lamp individually. The system is therefore highly variable, and it will recover the cost. All communication is secured by the local independent BTS station. It is conveniently positioned to ensure seamless communication with intelligent components installed directly on the smart light columns.



Smart street lighting



Location: Holešov, Czech Republic

Place of the installation: ELKO EP Holding



Modern street lighting („Smart Street Light“) can work almost independently and I also think practically. In the event of a fault, it can inform itself about the repair, even incorporating a fault prediction if the light source is losing power or aging. It can respond not only to the daylight level but also to the density of the

current traffic on the road or the area and accordingly adjust the intensity of the light. This reduces costs and increases security. Light sources in such lights are mainly LEDs capable of saving up to 60 percent of energy. Moreover, frequent switching or dimming does not matter.



Industrial zone

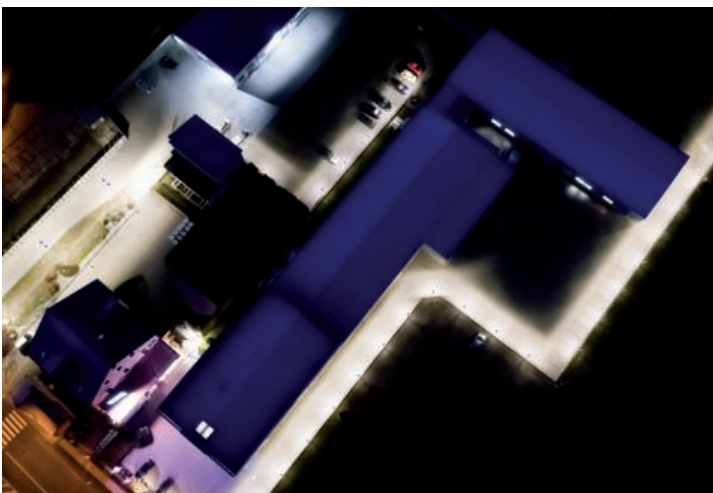
Lights on 25%



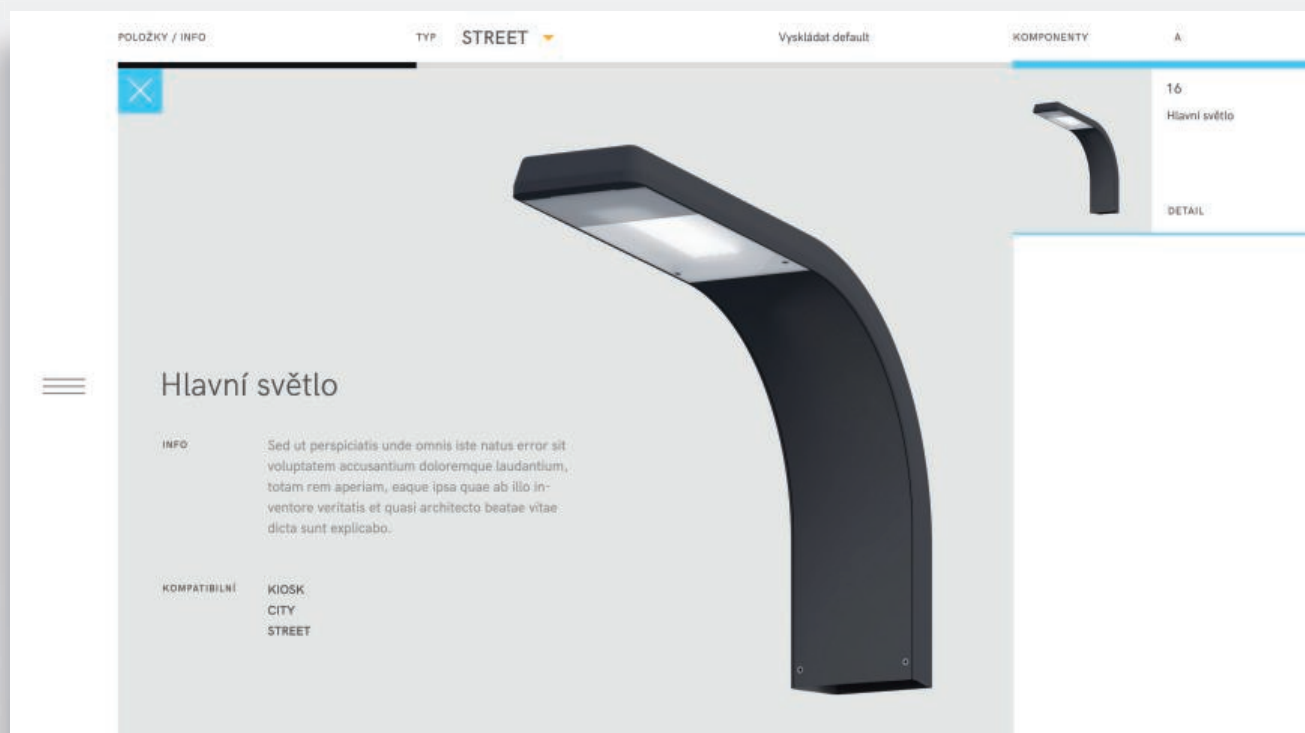
Lights on 75%



Lights on 100%



Smart pole



Configurator

POLOŽKY / INFO

VAŠE KONFIGURACE

Výška 280 cm
Hmotnost 170 kg
Celková cena **189 500 Kč**

Ka stažení
Konfigurace v PDF
Uložit obrázky
Položkový rozpočet
Odeslat mailem

POUŽITÉ MODULY

19 Hlavní světlo
18 Pozíční světlo RGB
17 Kamera
16 Enviromentální modul ovzduší
15 Tlakový reproduktor 125
14 Info panel
13 Reproduktor
12 Podsvícený info panel
10 Dotykový panel
9 Platební systém
8 Qi (bezdrátová) nabíječka

STREET

+

300%

-

↺

KOMPONENTY

19
Hlavní světlo

DETAIL

16
Enviromentální modul ovzduší

DETAIL

16
Reproduktor

DETAIL

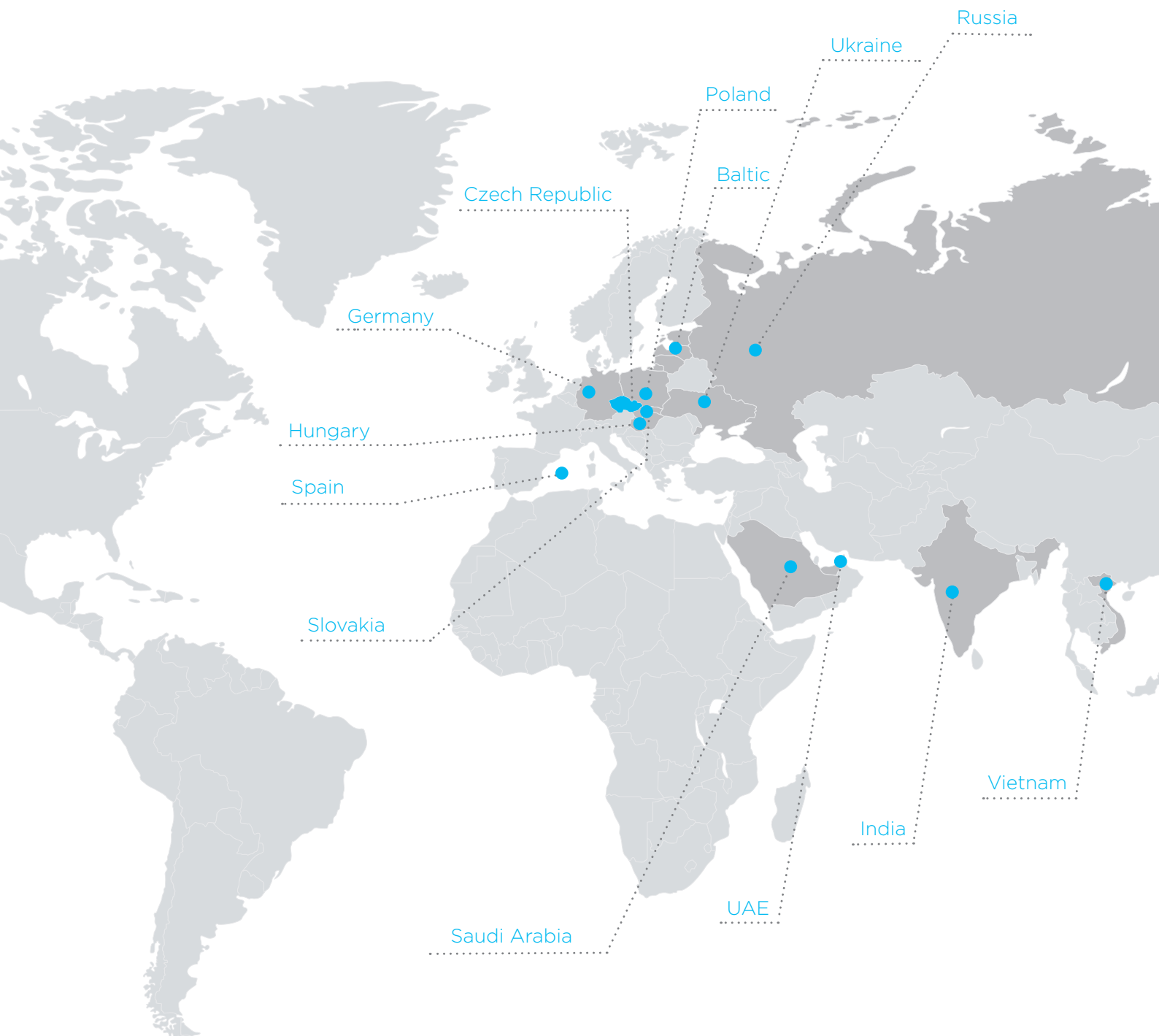
16
Enviromentální modul ovzduší

DETAIL



Each city is different, so is the pole, that will serve its inhabitants. That's why we've created this configurator to let you choose exactly what you need the pole to have. Whether the pole will be used for car charging only or will be lighting the city roads, you can be sure that it will be a great addition in your city.

ELKO EP Holding



www.tupex.se