



Tekes

# SMART CITY SOLUTIONS FROM FINLAND





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**SUMMARY OF  
TEKES WITTY CITY  
PROGRAMME**

SMEs co-funded by Tekes  
increased their exports

€2.6 B

in 2012–2015

SMEs expect projects  
initiated in 2016 to produce

€9.4 B

in turnover during  
the target year.



## INTRO

*Finland is a northern, sparsely populated country, where conditions vary greatly between different seasons. Life and traffic must flow smoothly whether the temperature outside is -20 °C or +20 °C. These stringent conditions are forcing innovation.*

The aim of this brochure is to introduce a variety of smart Finnish solutions and projects that Tekes has co-funded. Thematic areas covered are smart energy and buildings, smart transport and mobility, and services related to these themes. Finnish Smart Cities are also presented.

Tekes has worked with the top innovative companies and research units in Finland. Every year, Tekes has financed some 1,500 business research and development projects, and almost 600 public research projects at universities, research institutes and universities of applied sciences. Research, development and innovation funding is targeted at projects that create in the long-term the greatest benefits for the economy and society.

In 2018 Tekes and Finpro, the Finnish trade promotion organization, will be merged into a new organization with the working title Business Finland.

Business Finland will gather all services related to innovation funding and the promotion of exports, investments and travel under one roof.

## WHY FINLAND?

- **1st in World Economic Forum's Human Capital Index (2015)**
- **4th most competitive country in the world (WEF 2015)**
- **One of the innovation leaders in the EU (Innovation scoreboard 2015)**
- **Most stable society in the world (FPP 2014)**

# SMART TRANSPORT AND MOBILITY

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## GOING PLACES

*The world of mobility is changing rapidly. Urbanization has left cities struggling with congestion and air pollution. Social trends are pushing urban transformation towards liveable and car-free cities. Servitization, electric vehicles and autonomous cars are making people rethink car ownership and how they move about. All this calls for a new mobility ecosystem.*

In Finland approximately

# 17%

of household consumption expenditure is spent on transport and mobility.

**Finland is driving the revolution by developing smart solutions for the new mobility ecosystem.** From MaaS to autonomous driving, we already have many disruptive solutions and services up and running. We also have many open testbeds and development environments welcoming innovative and ambitious partners from all over the world. Whether you're a startup or an established player, now is the time to seize the opportunity and be part of the future of mobility.

## MAAS

Mobility as a Service (MaaS) is set to change the way the world moves. Door-to-door mobility services will let users see, book, pay and follow the realization of the travel chain. Finland is a forerunner in MaaS services. We want to enable the seamless and efficient flow of information, goods and people.

Different players are currently running numerous pilots and demonstrations around Finland, with many new companies providing MaaS services.

## AUTONOMOUS DRIVING AND CONNECTIVITY

We're not far from a time when owning a car will be less desirable than simply ordering a self-driving vehicle to your door when required. Autonomous driving is one of the most important new mobility technologies, and is set to shape a whole new economy and to provide a major option for last-mile mobility services.

Digitalization, 5G and artificial intelligence are crucial components when developing autonomous solutions. Finland has strongholds in all these areas. The technologies still need development, and there are many pilots and demonstrations going on. Our open testing platforms let you test new technologies and service concepts and get ahead of the competition.

Finnish companies today provide many connectivity solutions for the automotive industry.



## ELECTRIC VEHICLES AND TRAFFIC

The future is electric. Electric passenger vehicles are becoming mainstream in many markets, with public transportation following suit. Heavy machinery companies have started to introduce hybrid or pure electric work machines to the market. New businesses have popped up to provide services for electric vehicles and the ecosystem. Electric Vehicles are also a part of the future smart grid and energy storage system.

## LIGHT VEHICLES

More and more people are commuting on a bicycle, and bike share programmes and electric bikes are gaining momentum as the best last mile solution. A new law in Finland allows the use of light electric vehicles in public places and lanes, boosting the development of light vehicle businesses.

# 201

projects co-funded by the Tekes Witty City -programme between 2013 and 2017.

*Whether you're a startup or an established player, now is the time to seize the opportunity and be part of the future of mobility ecosystem in Finland.*

# COMPANIES

CO-FUNDED BY TEKES

## EKORENT – Electric solutions

EkoRent develops and offers zero-emission mobility solutions. Our fully digital rental and sharing services are based on Electric Vehicles and Solar Energy, and are used with a mobile application tailored for electric vehicles.

▶ [ekorent.fi](http://ekorent.fi)

## NOKIA – Autonomous driving

Nokia brings their expertise on 4G and 5G mobile networks to the world of automated mobility. The smart solutions offer limitless possibilities for future mobility and connectivity.

▶ [nokia.com](http://nokia.com)

## INFOTRIPLA – Autonomous driving

Infotripla provides innovative solutions for traffic information management, analysis and data exchange. Their solutions are designed to provide better mobility services in smart cities and transport networks.

▶ [infotripla.fi](http://infotripla.fi)

## VIRTA – Electric solutions

Virta is the leading provider of EV charging services in Finland, with clients in seven European countries. Virta's smart solutions cover the whole value chain.

▶ [virta.global](http://virta.global)

## PLUGIT – Electric solutions

Plugit democratizes charging. Plugit offers turn-key & white label EV charging solutions and Charging as a Service (CaaS). Plugit e-Mobility Platform enables multiple business models and services, as well as managing the multi-operator networks.

▶ [plugit.fi](http://plugit.fi)

## FLEETONOMY – Autonomous driving

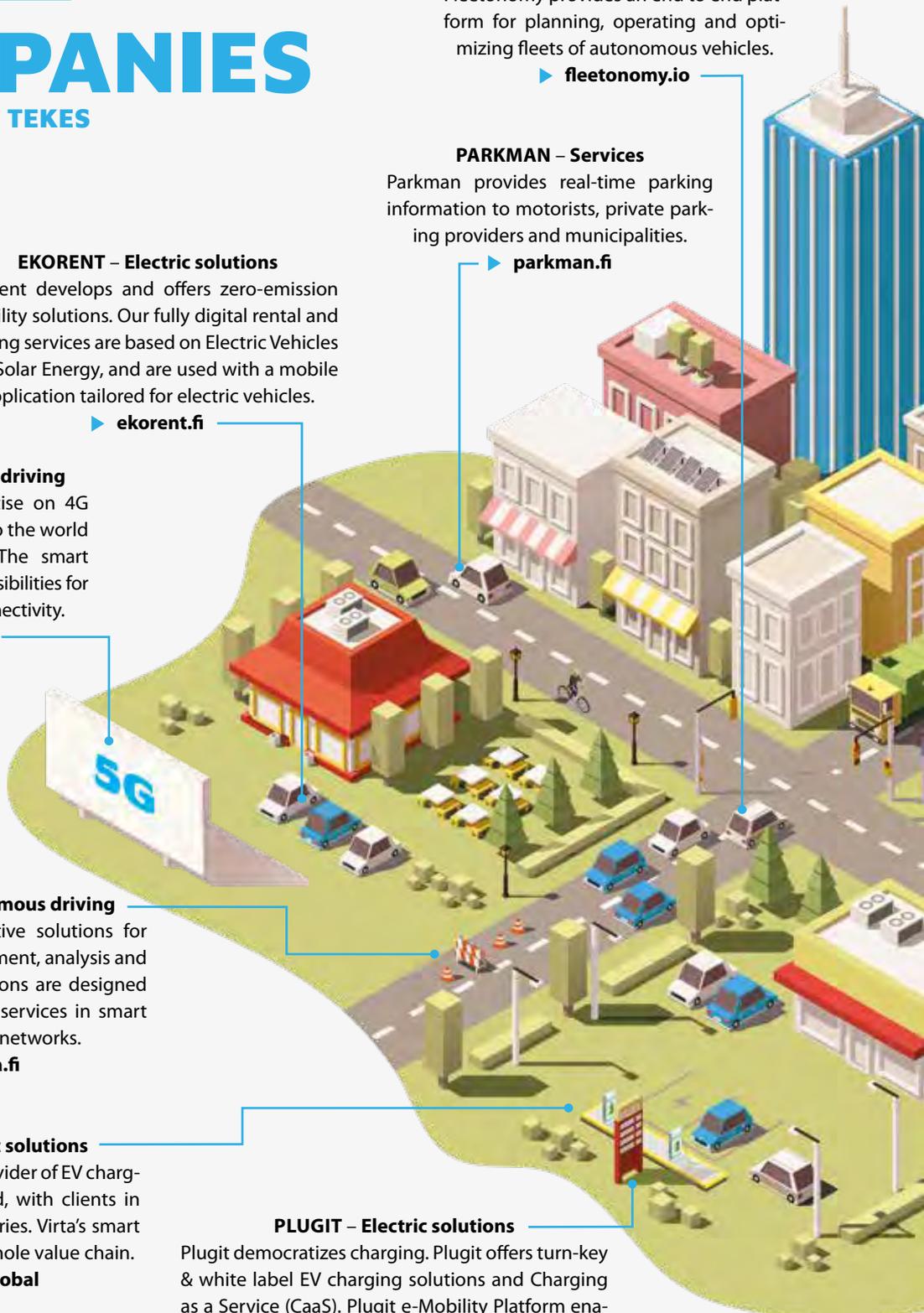
Fleetonomy provides an end to end platform for planning, operating and optimizing fleets of autonomous vehicles.

▶ [fleetonomy.io](http://fleetonomy.io)

## PARKMAN – Services

Parkman provides real-time parking information to motorists, private parking providers and municipalities.

▶ [parkman.fi](http://parkman.fi)



### **MAAS GLOBAL – Services**

The world's first ever mobility operator, MaaS Global is on a mission to free people from having to own a car. Their Whim mobile app lets you travel wherever and whenever, with public transport, taxis, brand-new cars and more.

▶ [maas.global](https://maas.global)

### **LEANPARK – Services**

Leanpark is a stylish and intelligent robotic parking system that moves cars into storage shelves where they are secured from weather conditions, damage and accidents.

▶ [leanpark.com](https://leanpark.com)

### **SHAREIT BLOX CAR – Services**

Shareit Blox Car is a peer-to-peer car sharing service that helps car owners find someone to rent their car to when they don't need it.

▶ [shareitbloxcar.fi](https://shareitbloxcar.fi)

### **LINKKER – Electric solutions**

Linkker builds electric buses with lightweight technology, energy efficient drivelines and fast charging. Linkker's solution leads to lower consumption and lower life cycle costs.

▶ [linkkerbus.com](https://linkkerbus.com)

### **PARKING ENERGY LTD – Electric solutions**

Parking Energy Ltd is a technology oriented parking electricity operator. We solve the issues within electric car charging in real estate environments.

▶ [parkingenergy.com](https://parkingenergy.com)

### **WITRAFI – Services**

Witrafı is using new technology to change the way we park. Users can now find and reserve parking spaces without having to circle around the block.

▶ [witrafı.com](https://witrafı.com)

### **PAYIQ – Services**

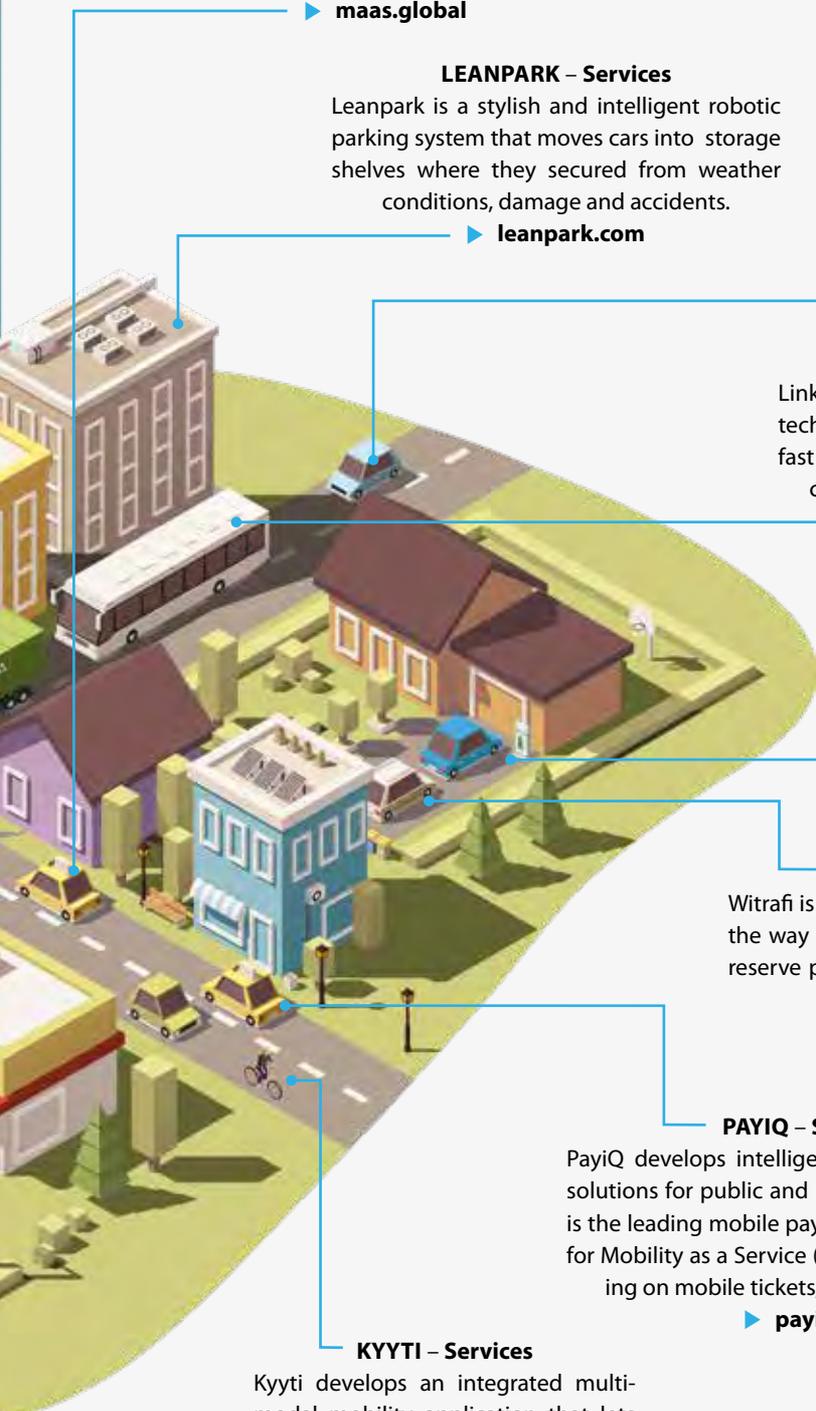
PayıQ develops intelligent cloud-based mobile solutions for public and private transport. PayıQ is the leading mobile payment solutions enabler for Mobility as a Service (MaaS) operators, focusing on mobile tickets, security and safety.

▶ [payiq.net](https://payiq.net)

### **KYYTI – Services**

Kyyti develops an integrated multi-modal mobility application that lets you plan your routes and compare mobility options and costs.

▶ [kyyti.com](https://kyyti.com)





## TRANSPORT AND MOBILITY

# RESEARCH PROJECTS

CO-FUNDED BY TEKES

### URBAN AUTO TEST

#### Urban Area Automated Driving

Development of Connected and Automated Driving (CAD) testing and verification facilities in the Tampere city area. The project focuses on enabling the testing of sensor suites in automated vehicles, development of sensor setups and automated vehicle control strategies. In addition, connected driving support functions are realized based on standardized C-ITS safety messages. The landmark info and traffic status signals are captured from the servers of the City of Tampere.

#### Partners:

VTT, Tieto, TTS, Taipale Telematics, HERE, LinkMotion, Nomovok, the City of Tampere, Trafi.

▶ [vtt.fi/sites/urbanautotest](https://vtt.fi/sites/urbanautotest)

### VAMOS!

#### MaaS

A seamless travel chain to your destination, easy planning of your trip and a combination of transport modes, and the possibility to buy your mobile tickets or other value adding services well in advance. VAMOS! partners are connecting their services through API (Application Programming Interfaces) to create new service offerings for festivals and events, travel destinations, travel agencies and cities among others, as well as directly to end users. The project is coordinated by VTT Technical Research Centre of Finland.

#### Partners:

PayIQ, ShareIT, Eventmore, Witrafi, Aplnf, Tuup, VTT, Place to Sleep, Solo International.

▶ [vamosapi.com](https://vamosapi.com)



## LIVING LAB BUS

### Electric Mobility

The goal of the Living Lab Bus environment is to enable the development, testing and demonstration of various services and technologies by using a real electric bus fleet as a testbed. The project provides an open platform for technology and service providers to develop, test and demonstrate new technologies and services. The project is coordinated by VTT Technical Research Centre of Finland.

#### Partners:

VTT, Aalto University, Tampere University of Technology, University of Tampere, Linkker, PayIQ, Ajeco, Foreca, City of Helsinki, City of Tampere, Cinia, EEE Innovations, HSL.

► [livinglabbus.fi](http://livinglabbus.fi)

## ROBUSTA

### Autonomous Driving

The key objective of the ROBUSTA project is to create a remote drive system that allows the use of semi-autonomous buses – and later other autonomous vehicles – in urban traffic conditions. The project will test and study technologies, like 5G networks and AI-assisted human-machine communication to remove the human operator from the bus and to put him or her in the control room responsible for multiple buses. The project is coordinated by Metropolia University of Applied Sciences and Demos Helsinki.

#### Partners:

Metropolia, Demos Helsinki, Nokia Infotripla, Flou, Nodeon, Fleetonomy.

► [robusta.fi](http://robusta.fi)

# SMART ENERGY

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## POWERING UP

***The majority of Finland's population lives in cities and towns.** Cities and communities use as much energy as industry. Urban development is therefore of great importance when trying to reduce energy consumption and greenhouse gas emissions.*

*Finland has a strong energy technology cluster. There are several world-class research teams and many SMEs and large companies working on new and interesting solutions. Clean energy solutions related to decentralized production are considered to be a significant international business opportunity for Finnish companies.*

***The Finnish electricity system is among the most advanced systems in Europe, and the world.** Certain advanced solutions are often referred to in this context: level of network automation, deployment of smart meters and the open energy market.*

## SMART GRIDS

Smart grids in Finland have the lowest transmission losses in the world. Many smart grid functionalities, load profiling, real time billing and distributed power generation are already implemented in the system. Finland is one of the few European countries where hourly data can be read remotely from the meter.

## ENERGY EFFICIENCY

In international comparison, Finland ranks near the top with respect to many energy saving measures and the efficiency of energy use. The majority of the Finnish cleantech business value comes from energy efficiency-related technologies. Cogeneration of heat and electricity, broad coverage of voluntary energy efficiency agreements and systematic energy auditing are good examples of successful energy saving measures implemented in Finland.

## RENEWABLES

Finland is one of the world's leading users of renewable sources of energy, especially bioenergy. The amount of electricity produced with renewable energy sources was 45% of total electricity production in 2016. The focus is on wood- and bio-based bio-fuels, but interest in solar energy and energy storage technologies is on the upswing. Solar energy, geothermal energy, heat pumps and various bioenergy-related solutions will also complement district heating and cooling production.

## SMART OTANIEMI

### LIVING LAB DEVELOPING THE FUTURE SMART ENERGY SYSTEM

Smart Otaniemi is a carbon-neutral energy area integrating sustainable resources and active customers with a resilient energy system. Focus areas are energy data, energy efficiency and renewables, and real-time monitoring and control.

The Otaniemi ecosystem already has around 20 partners. It is constantly developing and new partners can join.

► [smartotaniemi.fi](http://smartotaniemi.fi)

# 45%

The amount of electricity produced with renewable energy sources.



# COMPANIES

CO-FUNDED BY TEKES

## LEANHEAT – Energy efficiency

Smart building control and maintenance powered by IoT. Fully automated and self-learning, Leanheat's solution provides real-time optimization not only for individual buildings, but entire clusters of apartment buildings.

► [leanheat.com](http://leanheat.com)

## OILON – Solar

Oilon provides industrial heat pumps and cooling plants, ground source heat pumps, solar heat collectors, and burners and combustion.

► [oilon.com](http://oilon.com)

## WIREFAS – Systems, Smart Grid

Wirepas provides reliable, optimized and scalable device connectivity. There is no need for traditional repeaters, because every wireless device is a smart router of the network.

► [wirepass.com](http://wirepass.com)

## SOLNET – Solar

Solnet Group is a Smart Solar Solutions provider offering IoT enabled solar utilities and systems integrations for B2B customers as a managed service and turnkey solution.

► [solnet.group](http://solnet.group)

## EMPOWER – Systems, Smart Grid

Empower delivers smart energy market enabling services and ICT systems. Empower also builds and maintains power and telecom networks, provides power plant maintenance and management as well as services for industrial production processes.

► [empower.eu](http://empower.eu)

## FOURDEG – Energy efficiency

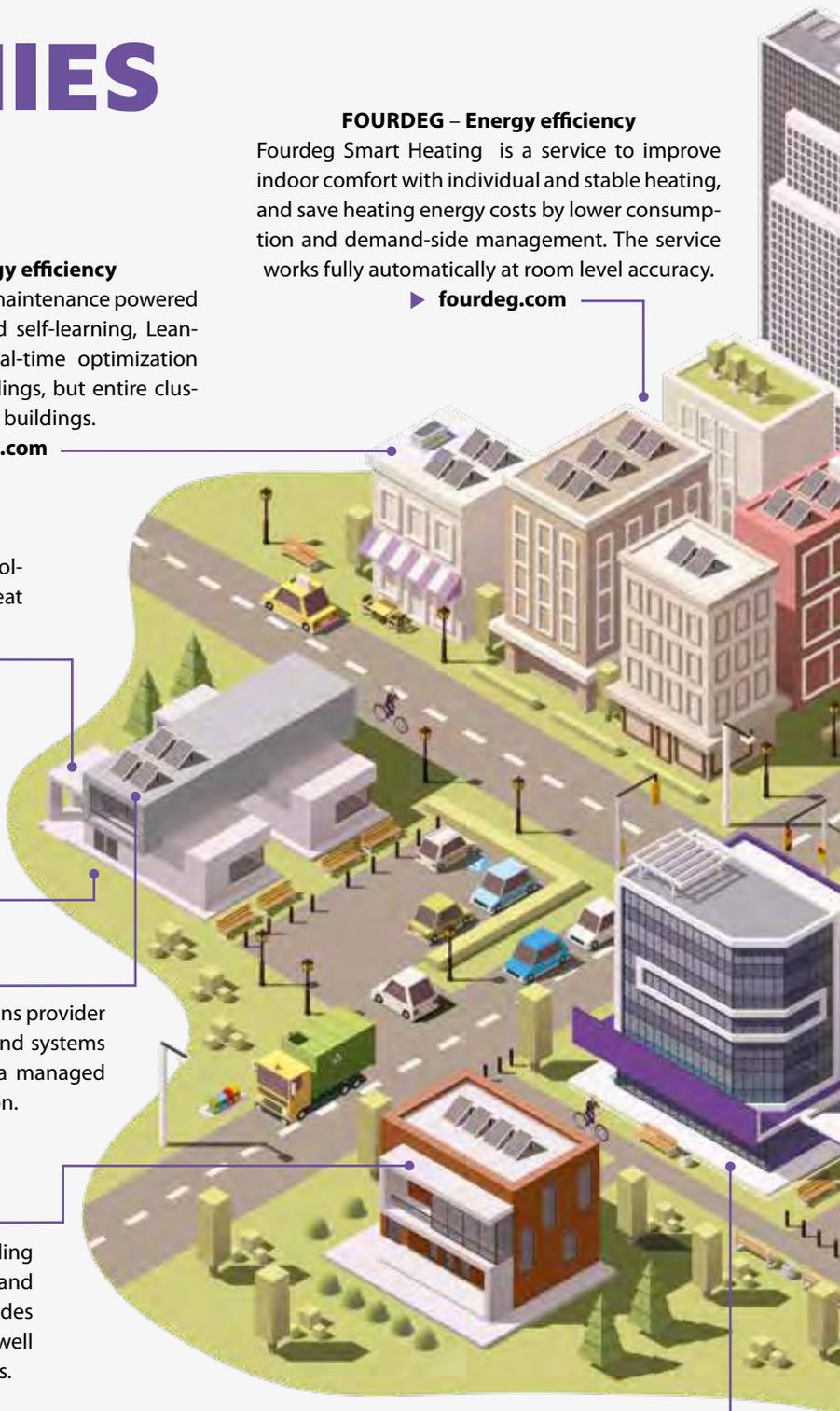
Fourdeg Smart Heating is a service to improve indoor comfort with individual and stable heating, and save heating energy costs by lower consumption and demand-side management. The service works fully automatically at room level accuracy.

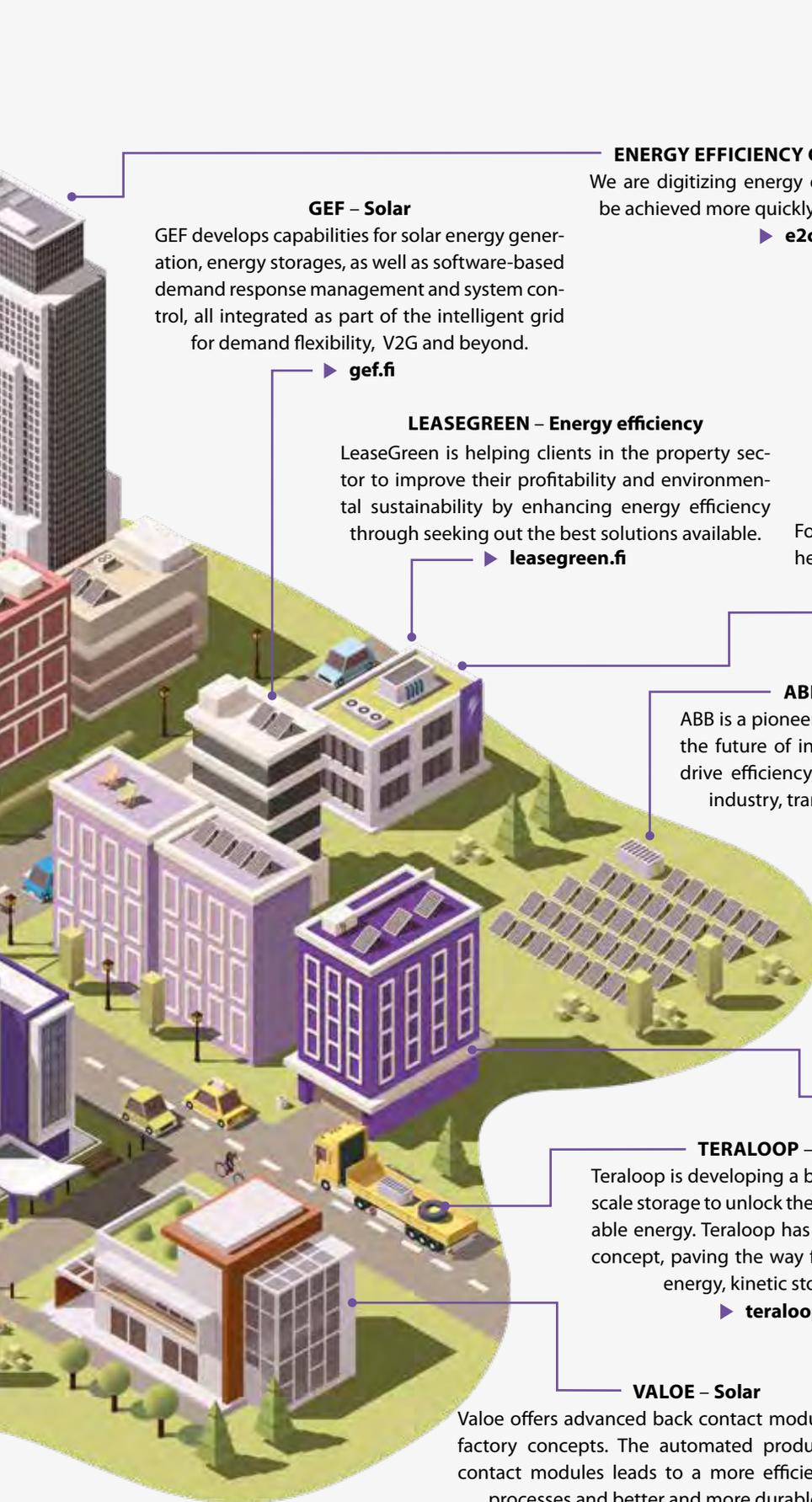
► [fourdeg.com](http://fourdeg.com)

## BROADBIT BATTERIES – Storage

BroadBit is a technology company developing batteries using novel sodium-based chemistries to power the future green economy.

► [broadbit.com](http://broadbit.com)





**ENERGY EFFICIENCY CLINIC – Energy efficiency**

We are digitizing energy efficiency. Energy savings can be achieved more quickly, cost-effectively and reliably.

▶ [e2clinic.com](http://e2clinic.com)

**GEF – Solar**

GEF develops capabilities for solar energy generation, energy storages, as well as software-based demand response management and system control, all integrated as part of the intelligent grid for demand flexibility, V2G and beyond.

▶ [gef.fi](http://gef.fi)

**LEASEGREEN – Energy efficiency**

LeaseGreen is helping clients in the property sector to improve their profitability and environmental sustainability by enhancing energy efficiency through seeking out the best solutions available.

▶ [leasegreen.fi](http://leasegreen.fi)

**FORTUM – Systems, Smart Grid**

Fortum provides customers with electricity, heating and cooling as well as smart solutions to improve resource efficiency.

▶ [fortum.com](http://fortum.com)

**ABB – Systems, Smart Grid**

ABB is a pioneering technology leader that is writing the future of industrial digitalization. Every day, we drive efficiency, safety and productivity in utilities, industry, transport and infrastructure globally.

▶ [abb.com](http://abb.com)

**OPTIWATTI – Energy efficiency**

OptiWatti makes smart energy management easy. The solution optimizes energy usage on heating and cooling on room level with a smart and predictive control mechanism. For utilities OptiWatti offers a solution to boost demand response.

▶ [optiwatti.fi](http://optiwatti.fi)

**TERALOOP – Storage**

Teraloop is developing a breakthrough in utility scale storage to unlock the integration of renewable energy. Teraloop has evolved the flywheel concept, paving the way for a large scale, high energy, kinetic storage system.

▶ [teraloop.com](http://teraloop.com)

**VALOE – Solar**

Valoe offers advanced back contact modules and smart factory concepts. The automated production of back contact modules leads to a more efficient production processes and better and more durable products.

▶ [valoe.com](http://valoe.com)



## ENERGY

# RESEARCH PROJECTS

CO-FUNDED BY TEKES

### WORLD-CLASS EFFICIENCY

#### **Black Silicon for Highly Efficient Solar Cells and Modules**

Professor Hele Savin's group has obtained the world record-breaking efficiency rate of 22.1% on nano-structured silicon solar cells. The goal of this project is to upscale the technology and demonstrate the significance and impact of the previous academic results on an industrial scale. To achieve this, the team is already manufacturing full-sized prototype solar panels from atomic layer deposition-coated black silicon cells.

#### **Partners:**

Coordinator Aalto University, NAPS Solar Oy, Okmetec Oyj, Beneq Oy, Valoe Oyj, and partners from Spain and Germany.

### FINNISH SOLAR REVOLUTION

#### **Balance of power system**

One of the objectives of the 'Finnish Solar Revolution' project is to prepare for the future solar power trends and envision new technologies. Production and consumption in the power system must be balanced at all times, power quality must be ensured, storage of electricity must be solved, solar power plant monitoring and optimization must be developed for varying weather conditions.

#### **Partners:**

Tampere University of Technology, Aalto University, Lappeenranta University of Technology, Aino Energia, Caruna, Convion, Fortum, Eaton, Elenia, MX Electrix, Nocart, Tampereen Sähkölaitos, Tampereen Sähköverkko, Lempäälän Energia. In parallel company projects by ABB, Efore, Ensto and Sola Sense.



## SOLETAIR

### Fuels and materials from air

SOLETAIR is the world's first pilot plant capable of producing hydrocarbons from the air by using solar power as the energy source. The products can replace fossil resources in fuels, chemicals, materials and even medicine. The solution makes it possible to achieve a carbon neutral future.

The raw materials, carbon dioxide and water, are separated from the air. Hydrogen is generated from water by means of electrolysis. Energy consumed in the electrolysis is supplied by a solar power plant. Finally, CO<sub>2</sub> and hydrogen are combined to form hydrocarbons in a synthesis reactor operating at high pressure and temperature.

#### Partners:

The main research partners: Lappeenranta University of Technology and VTT Technical Research Centre of Finland. Several industrial partners: ABB, ENE Solar Systems, Gasum, Woikoski, GreenEnergyFinland (GEF), Proventia, Hydrocell.

► [soletair.fi](http://soletair.fi)

## CLIMAPOLIS

### Urban energy platform

The efficient utilization of advanced, large scale cleantech technologies in urban structures requires advanced and efficient business models. The objective of the research project is to develop an advanced urban energy platform concept and architectural urban vision. The urban energy platform is globally unique and is developed within real estate and infrastructure building processes to allow for a cost efficient manner to reform dominant energy infrastructures, whilst improving the added value and capabilities of actors within the business ecosystem. The project is coordinated by Aalto University.

#### Partners:

Aalto University, City of Vantaa, Skanska, LAK Real Estate, SRV, Vantaan Energia, Lemminkäinen, Uponor, Finnair, NCC, Ruukki, Oilon, Nordic Shine, Calefa, Aidon, GEF.

# SMART BUILDINGS AND PLANNING

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## **BUILDING GREEN**

*The average temperature in Helsinki on the southern coast of Finland is approximately 6°C, and the seasons vary from warm summers to cold and snowy winters.*

*The harsh weather conditions have forced us Finns to be innovative in developing smart and resource-efficient solutions. These solutions highlight advanced concepts for city planning, as well as sustainable and smart living, energy, and mobility services integrated with modern ICT technologies. The sustainable built environment is completed with advanced waste management, lighting and recycling.*

## CITY PLANNING

Finnish cities, research teams and companies are involved in progressive activities for developing participatory, sustainable and digital urban planning, including public-private-people partnerships.

## SMART BUILDINGS

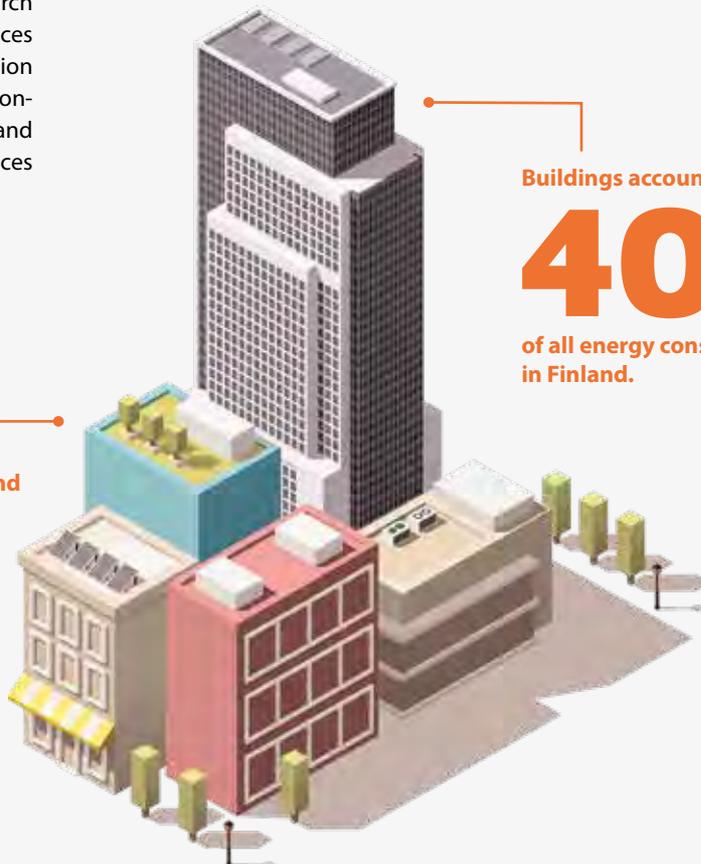
Buildings and real estate account for approximately half of the total capital and 40 per cent of energy and material resources globally. Buildings are becoming smarter and increasingly data intensive.

Finnish state-of-the-art competence can serve as a basis for the solutions that are developed for global needs. Finnish companies and research teams have specific competences in areas like building information modeling (BIM), energy efficient construction, energy efficient homes and home automation, smart workplaces and indoor air quality.

Digital solutions and technologies like Augmented and Virtual Reality, IoT, 3D modelling and Artificial Intelligence are transforming the whole society as well as city planning processes. Many Finnish companies are providing state-of-the-art digital solutions.

*The harsh weather conditions have forced us to be innovative.*

**NO. 1** in BIM usage and development.



Buildings account for

**40%**

of all energy consumption in Finland.

# COMPANIES

CO-FUNDED BY TEKES

## ENERON – Service Solutions

Eneron analyzes entire property portfolios, understands the needs of real estate business and the strategy of property owners, and optimizes energy efficiency investments.

▶ [eneron.fi](http://eneron.fi)

## 720 DEGREES – System Solutions

720° is a cloud-based analytics solution for the collection and evaluation of indoor environmental quality data such as: air quality, thermal comfort and noise pollution.

▶ [720.io](http://720.io)

## GRANLUND – Service Solutions

Granlund specializes in design, consultancy and software services. The core of its expertise is energy efficiency.

▶ [granlund.fi](http://granlund.fi)

## ADMARES – Building Solutions

Admares' innovative floating structures create new valuable real estate on the water. The company is pioneering construction methods that combine cutting-edge marine, land and modular construction techniques.

▶ [admares.com](http://admares.com)

## ENEVO – System Solutions

Enevo is able to create efficiencies and cut the cost of waste collection by collecting and analyzing data from refuse containers across the world.

▶ [enevo.com](http://enevo.com)

## KONE – Building Solutions

KONE People Flow Intelligence offers solutions for smart buildings: access and destination control, information communication and equipment monitoring.

▶ [kone.com](http://kone.com)

## COZIFY – System Solutions

Cozify is a wireless smart home hub that connects smart devices from different manufacturers into one seamlessly working entity.

▶ [cozify.fi](http://cozify.fi)



### GLASTON – Building Solutions

Glaston is developing equipment for the processing of smart glass. The properties of intelligent or smart glass and window glass can be altered when needed.

▶ [glaston.com](http://glaston.com)

### TRIMBLE – Service Solutions

Trimble drives the evolution of digital information models to provide greater competitive advantage to the construction, infrastructure and energy industries. Trimble currently has customers in over 100 countries, its own offices in over 20 countries, and a global partner network.

▶ [trimble.com](http://trimble.com)

### HALTON – System Solutions

Halton Group is the global technology leader in indoor air solutions for demanding spaces.

▶ [halton.com](http://halton.com)

### NUUKA SOLUTIONS – Service Solutions

The Nuuka building process analytics platform combines industry expertise with state-of-the-art building analytics software to make your building the smartest on the block.

▶ [nuukasolutions.com](http://nuukasolutions.com)

### SITOWISE – Service Solutions

Sitowise helps cities and infrastructure owners to gain cost-efficiency by digitalizing urban planning, construction and maintenance. We help cities to set up data infrastructures and 3D city models, which form a platform for smart city applications.

▶ [sitowise.fi](http://sitowise.fi)

### AINS – Service Solutions

AINS is a growing international expert in construction management and design. With Cityfier you are able to compare alternative plans for neighbourhoods and get a forecast of the area's value development.

▶ [ains.fi](http://ains.fi)

### FIRA – Service Solutions

Fira builds spaces perfectly tailored for how they will be used. The projects are based on co-operation, from the design phase all the way to commissioning. Fira is a forerunner in development and use of digital tools to build smarter.

▶ [fira.fi](http://fira.fi)

### iLOQ – Building Solutions

iLOQ transforms mechanical locking into digital access management. iLOQ provides self-powered digital locking and access management, without batteries or cables.

▶ [iloq.com](http://iloq.com)

### LIGHT COGNITIVE – Building Solutions

Light Cognitive creates lighting solutions for personal well-being and performance. Big Sky produces a dynamic natural skylight view, allowing people to enjoy long clear days even when the real days are short or cloudy.

▶ [lightcognitive.com](http://lightcognitive.com)



## BUILDING AND PLANNING

# RESEARCH PROJECTS

CO-FUNDED BY TEKES

### DRUMBEAT

#### Linked Building Data online

DRUMBEAT produced web-based solutions for sharing data in real industry-driven use cases at different phases of the construction life cycle: design coordination, supply-chain management and facility management. The project implemented an open-source Linked Building Data platform for sharing IFC models in a granular manner over the web and for linking these models to other building data. The DRUMBEAT platform is the first implementation of a Linked Building Data platform for operational data publication, and has led to further R&D projects and a spinoff company.

#### Partners:

Aalto, VTT, Trimble, Solibri, Granlund, Skanska, Parma, Progman, A-Insinööri. Spinoff: Visualynk.

### VARPU

#### VR and AR solutions

The project focuses on virtual (VR) and augmented reality (AR) in the context of industrial applications, including construction, facility management and resource-aware buildings. Varpu will improve methods to capture 3D models and 360-degree video in difficult lighting environments and with various depth sensors, and further implement new methods to employ these data sources as enablers for wide area AR tracking. The project will conduct basic and applied research to find the requirements, opportunities and limitations of multimodal VR/AR interfaces. The VARPU consortium includes top research units, large companies and innovative growing SMEs.

#### Partners:

University of Tampere, Aalto University, FGI, VTT, Granlund, 3D Talo, Ruukki, SkyHighVR Oy.



## iCONS

### Intelligent Construction Site

Aalto University and a consortium of eight Finnish companies, including end-users from the construction and ship building sectors, software companies and a large teleoperator, intend to revolutionize construction management through intelligent data-driven systems. The objective is to develop the concept of an intelligent construction site that utilizes and combines real-time data from all construction resources, such as labour, material and equipment. With the iCONS system, location-based data can be collected in real time from construction sites, supporting and improving management processes such as planning, control, safety and logistics. Project teams will benefit from more accurate and real-time information.

#### Partners:

Aalto, Movenium, Fira, Skanska, eRent, Elisa, Trimble, YIT, Carina Solutions.

## LUX TURRIM

### 5G for smart cities

Our society and cities face challenges to improve safety, energy efficiency, air quality, effective transportation and quality of living. The LuxTurrim5G project will solve current digital ecosystem challenges with the following actions: a new smart light pole with 5G capability for small cells and many integrated sensors will be developed to enable fast high-speed communications and new digital services. The smart 5G light pole includes data transport from access points to a core 5G network and provides open interfaces for service platforms of operators, micro-operators and vertical industries. The interfaces enable the use of a single 5G network for all different services and providers in relevant smart city and 5G mobile network applications. Several service

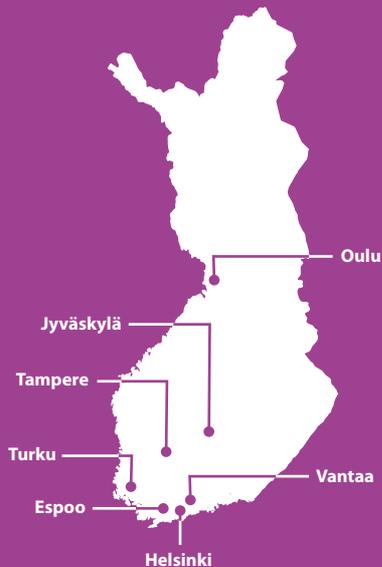
examples are being piloted to test the platform: video surveillance, weather and air quality monitoring, navigation, info sharing (active screens) and smart lighting. These are combined with modern city planning tools and business development. Radio wave propagation through building materials is also studied to establish sufficient outdoor-indoor connections.

#### Partners:

Aalto, TUT, VTT, Nokia Bell Labs, Sitowise, Vaisala, Teleste, Exel Composites, Premix, Lammin Windows & Doors, C2Smart light, Indagon.

# SMART CITY EXAMPLES FROM FINLAND

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## CITY SMARTS

*A smart city uses digital technology to improve its performance, liveability and the well-being of its citizens. New technology and data is used for solving the cities' economic, social and environmental challenges.*

*Important smart city themes include energy, building, mobility, city planning and governance. Finnish towns are topping many Smart City rankings in Europe.*

# 54%

**of the world's population lives in cities; this will be 70% by 2050.**



# CITY OF HELSINKI

*Smart Kalasatama, Jätkäsaari Smart Mobility Lab and open data*

Helsinki has ambitious targets to become the world's most functional city and reach carbon neutrality by 2035. Smart solutions will help to achieve these goals.

Smart Kalasatama, a brownfield district in Helsinki, is a vivid Smart City experimental innovation platform. Smart Kalasatama is developed flexibly and through piloting, in close co-operation with 200+ stakeholders including residents, companies, city officials, start-ups and researchers. Kalasatama district will offer a home for approximately 25,000 residents and jobs for 10,000 people. Currently, there are 3,000 people living in the area. The vision of Kalasatama is that

smart services will save one hour of each citizen's time every day. The sharing economy is active in Kalasatama. People share cars and parking spaces with the help of digital applications. Smart locks in new buildings enable citizens to use many spaces in Kalasatama for their purposes. The first estates are already connected to the smart grid, and all the rest of the area to be built will benefit from the grid, enabling real time smart metering, electric vehicles network and new storage solutions for electricity. A solar power plant already exists in the neighbourhood and the whole district is connected to the district heating and cooling grid.

Jätkäsaari Smart Mobility Lab hosts the testing of MaaS and other smart mobility solutions. Soon self-driving robot buses will be in use for citizens in the streets of Vallila and Pasila districts.

Helsinki has already opened most of its data up so that it is available via Helsinki Region infoshare. Helsinki is the first Nordic city that has created a semantic CityGML 3D model of its entire area. This is also published as open data.

- ▶ [smartkalasatama.fi/en](https://smartkalasatama.fi/en)
- ▶ [forumvirium.fi](https://forumvirium.fi)
- ▶ [hel.fi/helsinki/en](https://hel.fi/helsinki/en)



# CITY OF VANTAA

*Aviapolis Airport City*

Future cities will be built close to busy airports all over the globe. Aviapolis, next to Helsinki Airport is one of the most interesting Airport City developments in the world.

Aviapolis is the shortest route between Europe and Asia and the fastest-growing business hub in Finland. At the same time, contemporary residential areas are growing rapidly as new homes are built. The combination of workplaces, residential areas and services, right next to the airport, makes Aviapolis a Smart Airport City. The

rapid growth of the area creates demand for the new innovative services and smart city solutions. This opens up a number of new business opportunities.

The City of Vantaa is developing Aviapolis in close co-operation with local stakeholders and business networks. At Smart City Expo, Aviapolis was presented by the city with ten partner companies. Their smart solutions are developed and tested in the airport city. The solutions aroused a lot of interest among Nordic pavilion visi-

**NO.1** Fastest growing business hub in Finland.

tors and altogether the expo offered companies great opportunities to internationalize and gather new business contacts and leads.

Our partner companies at Smart City Expo: 24 Rental Network, Vediafi, FLOU, Esri Finland, Vionice, GoSafe, SkenarioLabs, PlantSteps, Arctic Robotics and Polku Innovations.

► [aviapolis.fi](http://aviapolis.fi)



# CITY OF ESPOO

*The sustainable city as a service*

Espoo is an active enabler for co-creation and new innovations. It is the second biggest and the fastest growing city in Finland, located next to Helsinki. It has grown tenfold over the last 60 years. The city will be developed as a pioneering responsible, sustainable and close-to-nature city that is a good place to live, learn, work and be enterprising in. Espoo is building a sustainable and smart future through co-creation, mobility, construction and energy solutions with its active inhabitants, research institutions, communities and businesses from all over the world. We build effective services in a smart way by creating

opportunities for people, developing new service innovations, and through the use of new technology.

For co-creation we have created systematic, replicable and transferable models, e.g. KYKY, where Espoo schools open up for co-creation to gain new business. Such a systematic and effective form of co-creation has never before been implemented in Finland or abroad. Now the model of co-creation is also being extended to other city services under the slogan "Make with Espoo", which is calling both companies and city residents to join in with the co-operation.

*There are already 70 partners participating in the KYKY activities and the interest is extensive.*

The LuxTurrim 5G pilot project builds concrete enablers for the future smart city. This ambitious three-year project aims at bringing big data capacity available for companies and other users through a network of smart light poles that include antennas and base stations for the novel fast 5G networks. As an outcome, the project will make big data capacity available and provide an open access platform for new digital services – both technology- and business-wise.

►  **espoo.fi (smart and sustainable)**



# CITY OF TAMPERE

## *Smart Tampere programme*

Tampere is known for its courage in city development. It's no coincidence that it is the most desirable city in which to live, study and visit in Finland, and this is why we are heavily preparing for the future by developing not only new areas and ways of living but also the methods of transportation and services in all fields of life.

Our latest highlights are the smart city IoT platform process, the city guidance ecosystem project and STARDUST city development activities.

The smart city IoT platform aims to improve our city's capability to col-

lect and utilize data. This will create new business opportunities for our companies and the services that are created will improve the quality of life of our citizens. The platform model is defined together with companies and universities.

Guidance is a significant factor in increasing the attractiveness of city centres. Guiding people and large crowds more efficiently in city centres according to their needs, preferences and user-profiles improves safety, as well as the visibility and availability of small businesses and cultural attractions.

The core idea of STARDUST is to demonstrate different "innovation islands" as urban incubators of technological, social, regulatory and market solutions.

In addition, by April next year we will have a 5G-ready network in the Tampere City Region, thanks to Elisa.

► [smarttampere.fi](https://www.smarttampere.fi)



# CITY OF TURKU

## *Smart and Wise Turku*

Smart and Wise Turku is one of the spearhead projects of Turku, combining the strategic objective of regional carbon neutrality by 2040 with the Smart City concept. The project has five areas of focus: carbon neutrality and the effective use of resources; service coordination and digital services; safety; urban design; and transport and mobility.

### **Highlights of transport and mobility**

Regional bus traffic has an ID-based multimodal and integrated ticketing system. This has proven to be a suc-

cess and a platform for future smart solutions in mobility.

A new city bike share system will start in May 2018. The bike share system is going to be integrated into the FÖLI regional public transportation system. The FÖLIX last-mile by taxi pilot, delivered by regional bus traffic providers and local taxi operators, started in September 2016.

### **Carbon neutrality is a strong asset for Turku**

So far, measures taken by Turku have resulted in a 35 per cent reduction in

emissions compared to the level in 1990, as measured per resident. At the same time, the total reduction in emissions has been 25 per cent.

Strong energy investments in the Turku region – Turku Energia and its partners are investing 300 million euros in the production of renewable energy and energy distribution by the year 2018 – give Turku a head start in climate policy compared to many other large city regions in Finland.

► [turku.fi/karkihankkeet](https://turku.fi/karkihankkeet)



# CITY OF JYVÄSKYLÄ

*An Open Canvas for Innovation*

Our main urban development platform is the Kangas area, where an old paper mill area will be transformed into an active urban centre and housing area with:

- Cyber-secure digital user-centred services based on centralized identity and access management
- Smartness by experience – people involvement in planning and development, percentage culture principle, shared solutions like parking and yards, life cycle in mind
- Co-creation with universities and business – targeted at real big data

operations where data is gathered, stored and utilized by vast numbers of stakeholders.

Kangas has developed into a vibrant living lab and test bed environment where the basic structures enable and enhance business. In the future, Kangas will be a home to 5,000 inhabitants and 2,100 new jobs. Kangas will realize concrete solutions on top of city development platforms - with a target of implementing models and practices serving life cycles instead of disconnected development projects.

Other important platforms and development areas of the City of Jyväskylä are Kukkula, Hippos and the city centre.

► [businessjyvaskyla.fi/en/development](https://businessjyvaskyla.fi/en/development)



## CITY OF OULU

*Development for your needs*

In Oulu we are refining technology for everyone with the help of the innovative OuluHealth ecosystem, which supports creating medical technology devices and delivering better health services. Our other focus area in the smart city platform is the utilization of ICT.

Oulu is home to a thriving health and life science industry and is a recognized leader in the field of health technology. There are about 540 companies in this sector, and at least 240 of them are hi-tech companies. They

offer world-class expertise and aim at expanding into international markets, with export turnover increasing by 32% in the past six years. These companies are part of the OuluHealth ecosystem, which fosters co-operation between its stakeholders, creates novel solutions to global healthcare challenges, and stimulates economic growth in the region.

In Oulu, novel ideas are developed into market-ready products. The innovations related to modems, chip sets, terminal devices, information systems,

cloud services, and artificial intelligence will soon be commonly used with the arrival of 5G networks. Together with its partners, Oulu strives to respond to global challenges and leave its mark on development for future generations. By combining expertise in wireless know-how with health and life science technologies, smart ICT solutions are introduced in order to deliver advanced, personalized and connected health services.

► [oulu.com](https://oulu.com)

# A SHORT SUMMARY OF TEKES WITTY CITY 2012–2017 PROGRAMME

*Tekes's Witty City programme aimed to comprehensively support development of solutions for future smart cities, to enhance the formation of new businesses by connecting various sectors and by providing funding for innovative solutions and demonstrations.*

*The programme focused on three spearhead themes: 1) energy, 2) transport and mobility and 3) building and planning. The thematic focus areas were chosen because of an ongoing disruption in these sectors that enables rapid growth and potential for Finnish solutions. Digitalisation was defined as the main enabler for renewal.*

## FUNDING VOLUMES

During the years 2014–2017, the Witty City programme co-funded 201 projects with more than 55 million euros. In addition to the Witty City programme, smart city related activities have also been funded by other Tekes programmes, e.g. INKA, 5G and Industrial Internet. All in all, Tekes's funding

for smart city related projects totalled well above 100 million euros during the years 2014–2017. In addition, many Finnish smart city projects have received significant funding through the EU Horizon 2020 programme.

A full list of projects co-funded by the Witty City programme can be found at ► [tekes.fi/kaupunki](https://tekes.fi/kaupunki)

### SMART TRANSPORT AND MOBILITY

Electric vehicles,  
Autonomous vehicles,  
ITS, MaaS

### SMART ENERGY

Solar energy, Energy  
storage, Smart Grid

### SMART BUILDINGS AND PLANNING

Smart Home (Home automation,  
energy efficiency), BIM,  
AR/VR, AI

### SMART SERVICES AND DIGITALIZATION



### What has changed during the Witty City programme 2014–2017?

Several new startups in the energy efficiency and renewables sector have entered the market with innovative solutions, supported by world class research on future energy systems.

The transport and mobility sector has been evolving a strong ecosystem. New Mobility as a Service (MaaS) companies are offering solutions for cities and rural areas, many innovative startups are developing and testing new solutions for electric transport systems or for autonomous vehicles. Experts on artificial intelligence and disruptive digital technologies are increasingly interested in smart city applications. Building information modeling (BIM), the management of digital representations of physical and functional characteristics of buildings, is being widely developed and used. Augmented and virtual reality solutions are also increasingly used.

### Programme activities

The Witty City programme has arranged several **events** with a total of more than 3,500 participants. The biggest events have gathered hundreds of professionals to network and learn about innovations in the smart city sector. The programme has also arranged smaller seminars, webinars and morning coffee sessions on more specific themes. Focus has also been put on participating in energy, transport and buildings seminars arranged by others. The programme has been using **competitions** as a tool to promote innovations in the energy sector. In 2014 the competition was trying to identify new innovative systemic solutions while the 2016 competition was designed for startup companies.

### Internationalisation and communication

During the programme years, **internationalisation** gained more and more emphasis. The programme arranged several international business intelligence trips and joint exhibition pavilions for companies and cities, for instance for Barcelona, Amsterdam, Copenhagen, Hamburg and Vancouver. Systematic cooperation was built especially with other Nordic countries. The programme provided **training** on pitching and internationalization, as well as on cost-efficient product and supply chain solutions. Several **publications** have been produced for the different international events, presenting participating pioneering companies and cities. To keep the audience aware of the activities provided by the programme, **newsletters** have been sent to about 4,200 subscribers twice a month.

