Real estate industry challenges and digital solutions

Measuring the return on smart building investments in the Nordics and Baltics

ADL Telia

The real estate industry is in a perfect storm

Ever since office workers were sent home in early 2020, the real estate industry has been in a period of unprecedented change.

Reduced office occupancy rates, combined with rising energy costs and interest rates, have created a perfect storm that few could have foreseen only a few years ago. The challenge for building owners and managers is to navigate this storm, while finding new ways to increase profitability and sustainability.

In this report, we examine the current state of the building industry and the impact of these changes on commercial and residential building management. We also explore the new possibilities brought on by digitalization and quantify the return on investment and sustainability benefits that energy and air quality optimization can deliver. This report is ideal for those seeking to understand the challenges confronting the real estate industry and measure the value of the digital solutions available today.

This report is the latest in a collaboration between Arthur D. Little and Telia on insights in the Nordic and Baltic real estate industry and how digitalization and Internet of Things solutions are supporting real estate owners and building managers for more energy efficient and sustainable building operations.

The analysis and value calculations has been conducted by Arthur D. Little. Primary data and insights from Telia Company and Arthur D. Little, as well as from partners and enterprise customers in the Nordic building industry, are complemented and validated with industry expert interviews and professional research and reports.

Telia is a technology pioneer, digitalizing society for the past 160 years. Today our 20,000 talented colleagues serve 25 million customers across the Nordic and Baltic region with essential digital infrastructure and digital services that are fundamental enablers of the digital societies we live in. We are the telecommunications leader in the region, the leading Nordic media house, and the leader in ICT in both Finland and the Baltics. Read more at: www.business.teliacompany.com

Arthur D. Little is an acknowledged thought leader in linking strategy, innovation and transformation in technology-intensive and converging industries. We navigate our clients through changing business ecosystems to uncover new growth opportunities. We enable our clients to build innovation capabilities and transform their organizations. Read more at: www.adlittle.com

The real estate industry's post-pandemic landscape

The work-from-home revolution is leaving desks empty and leases in jeopardy

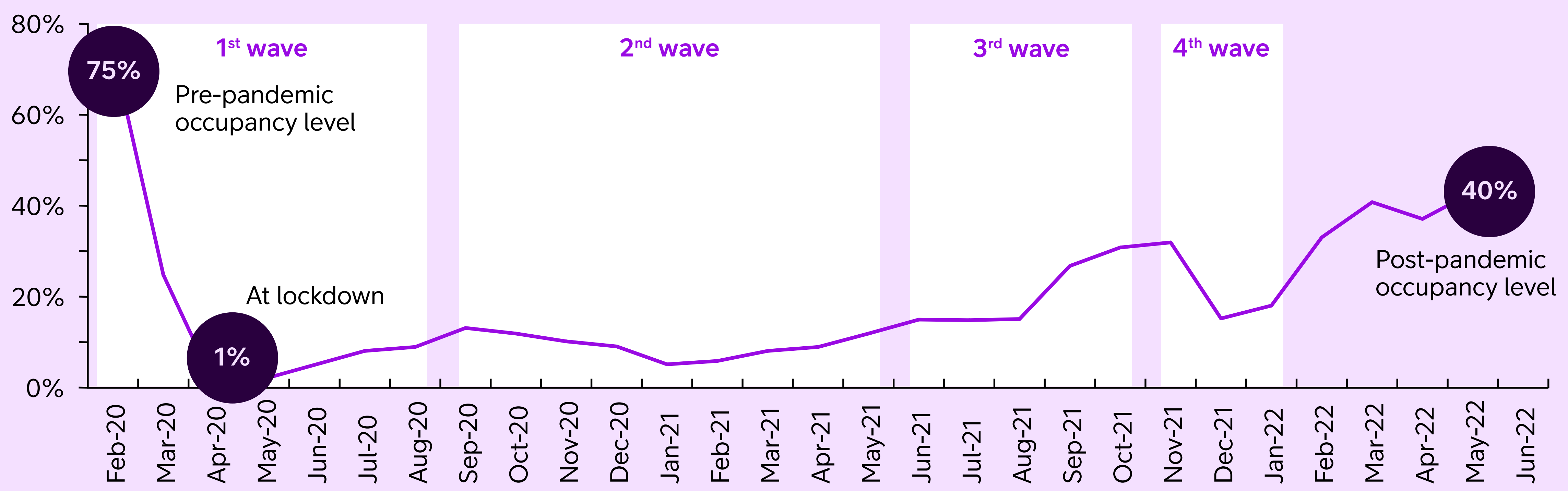
When millions of people were sent home at the start of the pandemic, it signalled a paradigm shift that saw remote work become part of the so-called, “new normal”.

Prior to the pandemic, office occupancy in Europe sat between 75–80 percent[1]. This plummeted to less than one percent following the initial lockdowns in early 2020. While it rose steadily as vaccinations made it safer to return to the office, occupancy rates plateaued at 40–45 percent in 2022 — a far cry from pre-pandemic levels. While multi-year lease cycles have delayed the impact on many building owners, continued low occupancy rates are raising red flags as companies reassess their real estate needs and look to down-size their office footprint.

1%

Office occupancy in European countries plummeted to less than 1% following the initial lockdowns in early 2020.

Lowered occupancy levels in offices



[1] Savills. Read more here.

Working from home is raising digital expectations

Digital expectations never go backwards. As soon as people experience a better connection, they expect it every time.

This was the case for many people whose apartments suddenly became their offices. They still expected the same high-definition, ultra-responsive digital experiences they were used to at the office, despite a massive increase in demand. As an example, the amount of time the average user spent in video meetings in Microsoft Teams increased by 252 percent between February 2020 and 2022[2]. This put huge demands on residential building networks and sent many residential building owners scrambling to fast-track fiber installations from already stretched fiber installers. With more time spent at home, higher expectations are also placed on having a comfortable indoor climate.

252%

Increase in time spent in Teams meetings February 2020–2022.

[2] Microsoft. Read more here.

Energy costs and interest rates are hitting buildings hard

As the pandemic subsided, the conflict-fuelled increase in energy prices, runaway inflation and subsequent interest rate rises have cast a heavy shadow over the real estate industry.

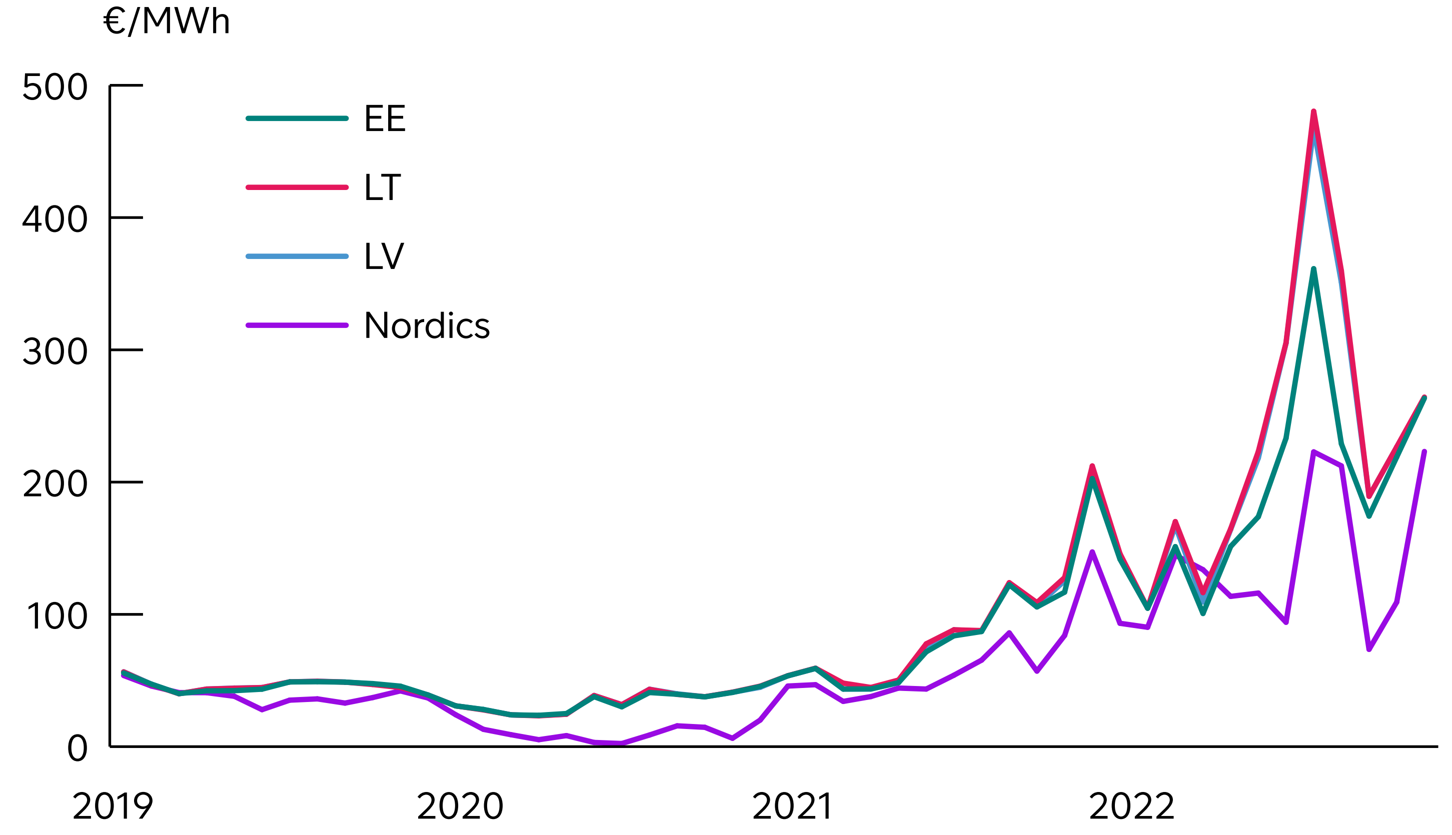
With energy markets in flux as a result of Russia's invasion of Ukraine, electricity prices in the Nordics and Baltics have risen to unprecedented levels. The average price for electricity in the Nordics in 2022 was 238 percent higher than the average 2021 price.[3] As 40 percent of all of Europe's energy consumption is in buildings, the real estate sector has been hit particularly hard.[4]

The rise in energy prices has also fuelled higher production and transportation costs, contributing to price increases for most goods and services. A 2023 survey on the European business environment found that inflation was the issue causing most concern: 91 percent in 2023, compared to 29 percent in 2021.[5] Inflation has forced central banks around the world to raise interest rates significantly. It is no surprise then that interest rates are the second most concerning issue in the same survey, with 89 percent of respondents expressing concern in 2023.

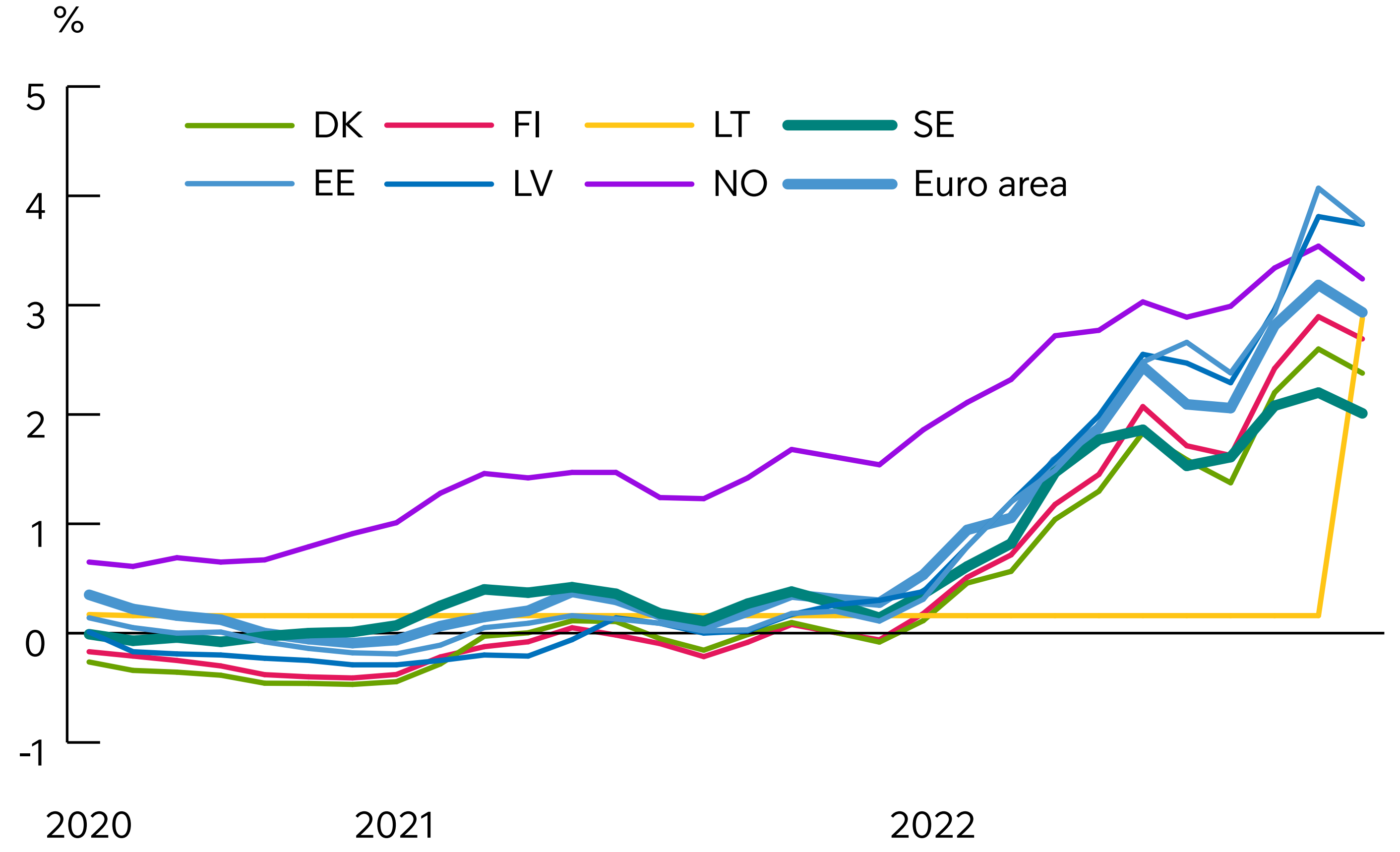
Studies have shown that 75 percent of buildings in Europe are not considered to be energy efficient.[6] In the cold, energy-intensive climates of Northern Europe in particular; finding new ways to increase energy efficiency and reduce consumption has become an urgent priority.

40% of all of Europe's energy consumption is in buildings.

Electricity prices[7]



Interest rates[8]



75% of Europe's buildings are not energy efficient today, which is problematic considering current energy prices.

38% of Nordic real estate companies' interest rates are maturing in less than one year.

[3] Energinyheter. Read more here.
[4] World Economic Forum. Read more here.
[5] PWC 2023 real estate survey. Read more here.
[6] European Commission. Read more here.
[7] Spot prices extracted from Nord Pool 05/01/23.
[8] Long-term interest rates collected from OECD, extracted 05/01/23.

Sustainability is still a burning issue

Sustainability may have fallen from the headlines during the pandemic, but it still represents the building industry's greatest challenge — and opportunity.

Globally, buildings generate 36 percent of all CO2 emissions.[9] This gives the industry not only the opportunity, but also the responsibility to reduce fuel consumption and CO2 emissions in any way possible. This responsibility is increasingly being driven by customers, investors and regulators.

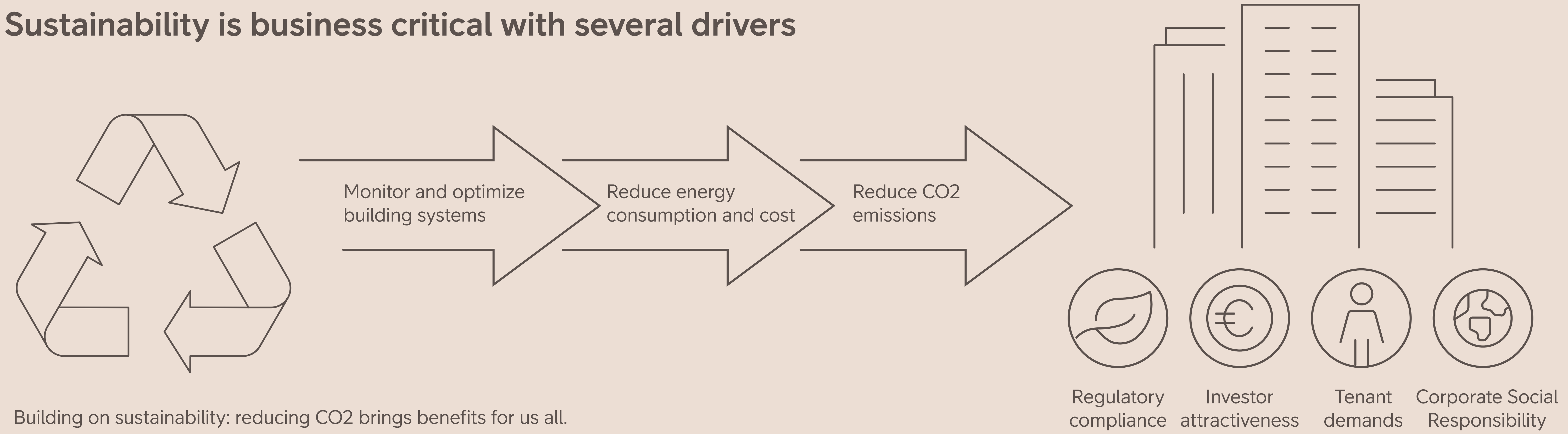
Examples of EU directives in this area include:

- **EU Energy Performance of Buildings Directive (EPBD)** sets energy performance requirements for new building developments.
- **EU Energy Efficiency Directive (EED)** sets requirements for long-term strategies to decarbonize building stock by 2050.
- **EU Green Taxonomy** provides a framework for classifying sustainable activities, establishing KPIs and providing transparent information for investors.[10]

More than two-thirds of European investors have already adopted Environmental, Social and Governance (ESG) into their investment criteria.[11] Similarly, in a recent European real estate survey 81 percent of respondents believed that ESG credentials will materially impact valuations over the next 12–18 months.[12]

With regulators and investors aligned, the need for data to prove ESG credentials is becoming a necessity for property owners looking to secure future investments.

Sustainability is business critical with several drivers



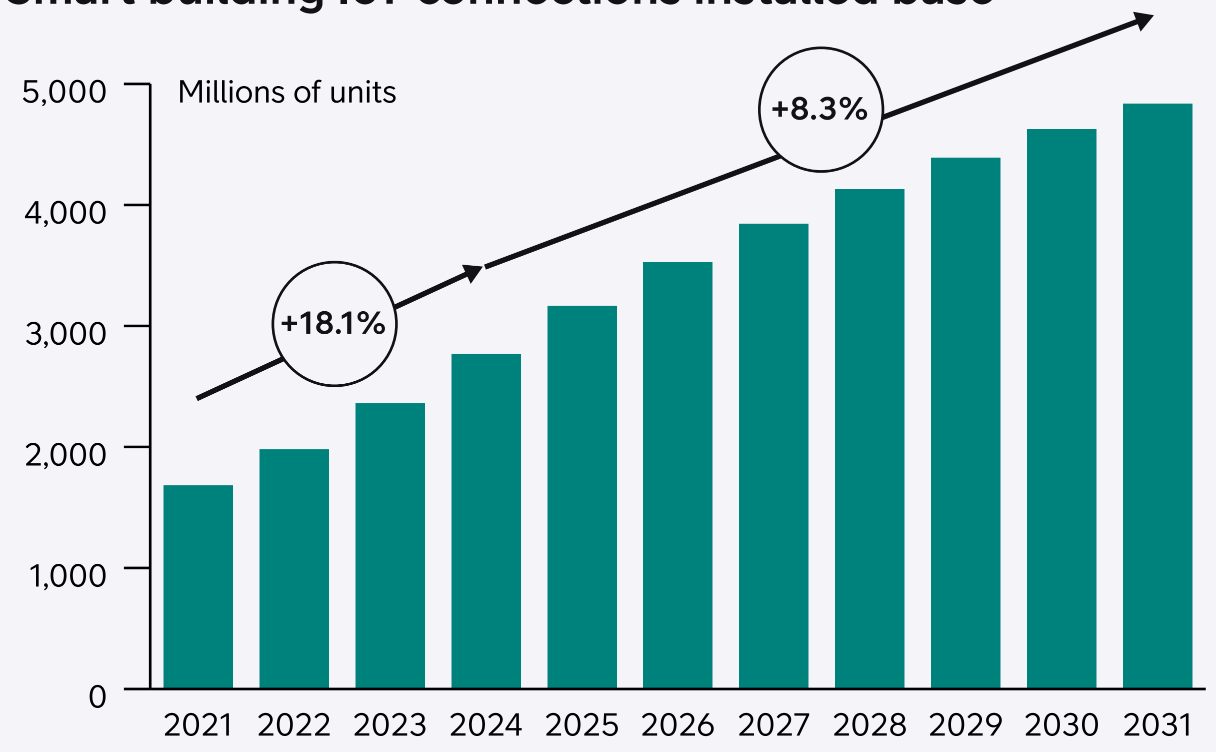
Building on sustainability: reducing CO2 brings benefits for us all.

[9] World Economic Forum. Read more here.
[10] European Commission, PWC. Read more here and here.
[11] CBRE Global Investor Survey 2021.
[12] PWC 2023 real estate survey. Read more here.

How digitalization is helping

The number of IoT connections is forecast to grow at a CAGR of 11.1 percent between 2021 and 2031, reaching an installed base of 4.8 billion units in 2031.[13] These are some of the main use cases currently being deployed.

Smart building IoT connections installed base



[13]Gartner IoT forecast.

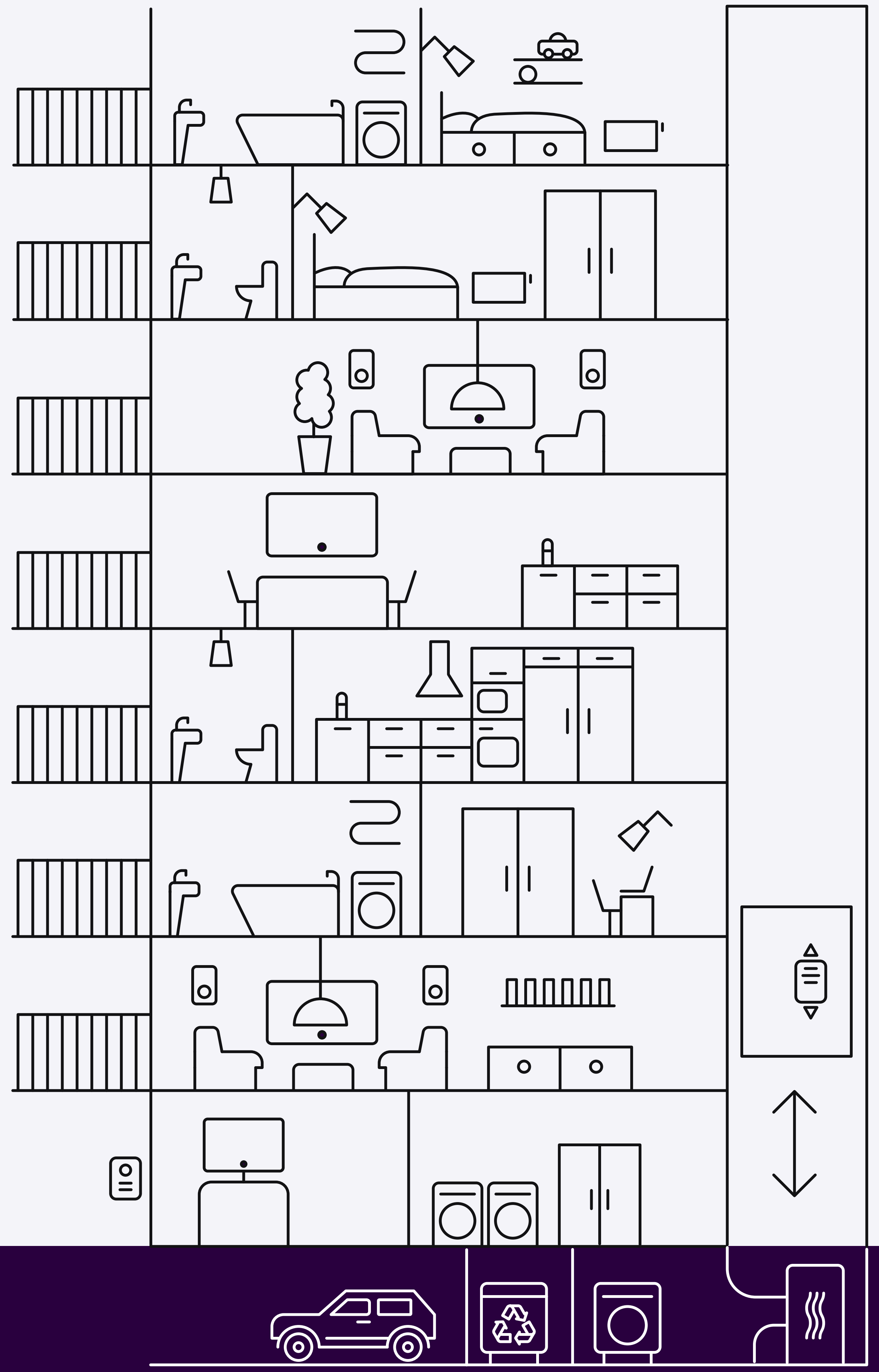
Fire and leak detection
Detecting problems and alerting relevant parties

Security & Access
Remote video monitoring and digital keys for temporary access or new tenants

Waste monitoring
Monitoring which bins need emptying for 'as-needed' servicing

Room and resource utilization
Monitoring meeting rooms and shared resources for maximize utilization

Asset utilization
Monitoring the location of shared assets and whether they are in use



Indoor climate monitoring
Providing a better tenant experience by optimizing indoor temperature

Heating optimization
Sending temperature data directly to heating system controllers

Digital Twins
A digital representation of the physical building for modelling optimization scenarios

Air quality monitoring
Monitoring air quality and pollutants for a healthier indoor environment

Elevators
Emergency communications and usage pattern analysis

Power and water monitoring
- Consumption monitoring
- Hidden leak detection
- Water usage insights

Measuring return on investment

There are many ways that IoT-enabled digitalization will unlock value in buildings. However, three stand out as providing the shortest time-to-money due to their cost and energy reduction potential, as well as their ability to provide a better tenant experience. To quantify cost savings and ROI, we have focused primarily on energy savings and the cost and CO_2 reductions that come with them.

Indoor Climate Monitoring
By monitoring the temperature throughout a building, it is possible to identify energy wastage and prevent the unnecessary costs and emissions that go with it. It also generates the data needed for ESG reporting and uncovering new energy efficiency insights.

Heating Optimization
By feeding the real-time indoor climate data into a HVAC controller, real-time optimization can be automated to provide increased tenant comfort at the same time as reducing unnecessary energy consumption and costs.

Air Quality Monitoring
By monitoring air quality, airborne pollutants, and CO_2, ventilation systems can be optimized for a healthier and fresher climate. Temperature monitoring also provides insights that enable the reduction of energy consumption and CO_2 emissions.

ROI Calculation Tool
To calculate the return on investment for these three use cases, we combined validated data from industry sources to develop an ROI calculation tool. On the following pages, we have applied three scenarios based on Northern European conditions. If you would like a calculation that is tailored to your specific situation, please contact Telia IoT for an assessment.

Single Residential Building

Portfolio of Residential Buildings

Portfolio of Commercial Buildings

Calculation: Indoor Climate Monitoring

Indoor Climate Monitoring lets you identify energy wastage so you can take action to prevent it. This reduces unnecessary energy costs and CO2 emissions. It also helps you see the big picture with insights that help you increase the energy efficiency of your building and comfort of your tenants. Remote monitoring also reduces the number of on-site visits required to check on tenant reports.

See page 14 to learn more about the calculation

Note: Additional investments are required to realize the energy efficiency gains enabled by Indoor Climate Monitoring. For example, windows identified as causing heat leaks will still need to be renovated before the problem is solved. These additional costs are not included in the calculations below.

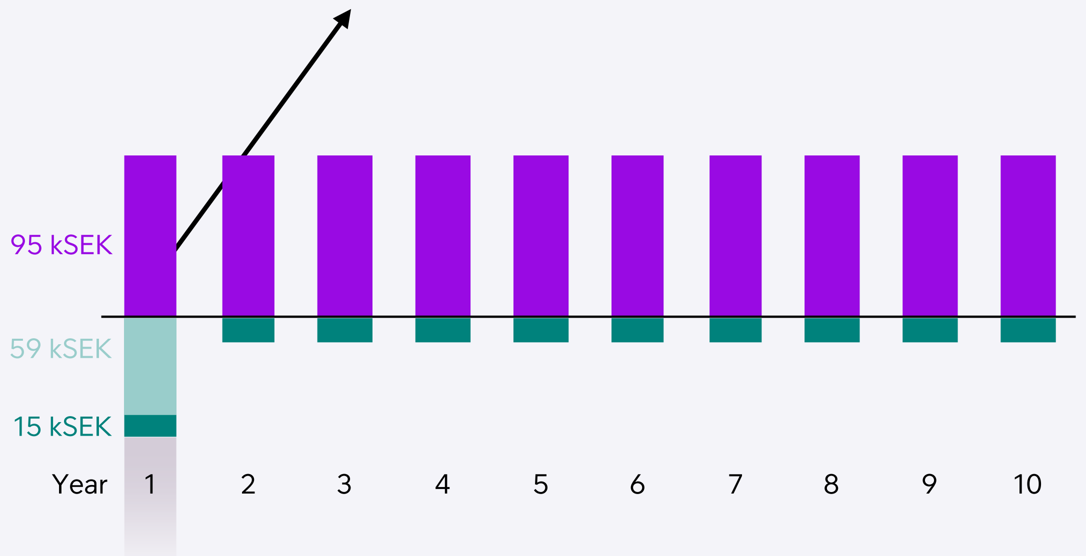
Additional benefits – tenant satisfaction and facility management:

- A more stable indoor climate.
- A more proactive service management identifying faults before complaints.
- Ability to locate technical faults in the heating system simplifying repair.

Use case value | CAPEX (inc. VAT) | OPEX (inc. VAT) | Illustrative necessary investments | Accumulated net value

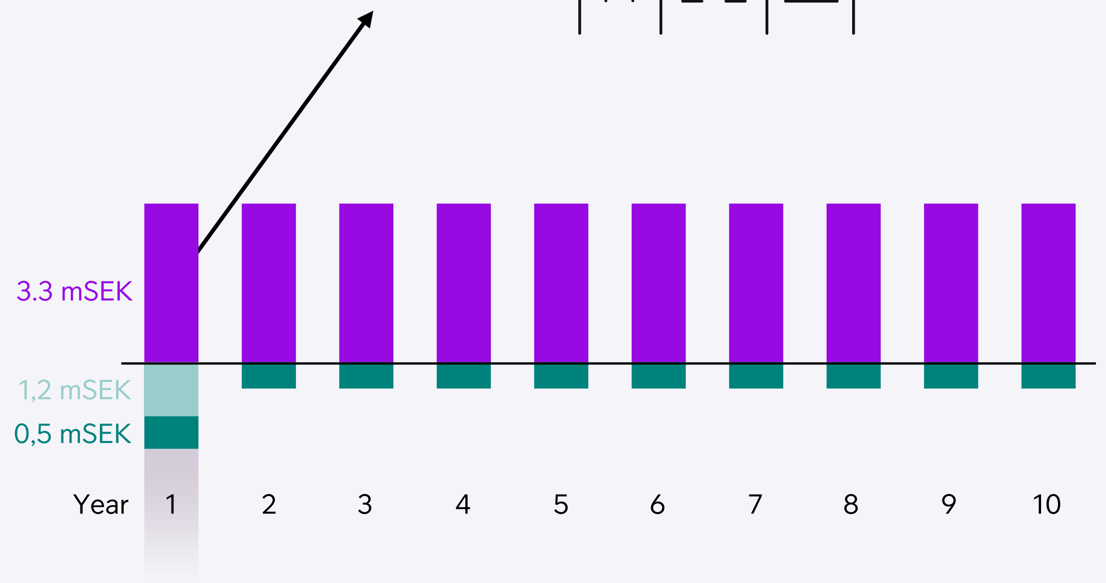
Single Residential Building

- 1 property: 4,000 m²
- Northern Europe
- Low digital maturity
- Building pre-1965



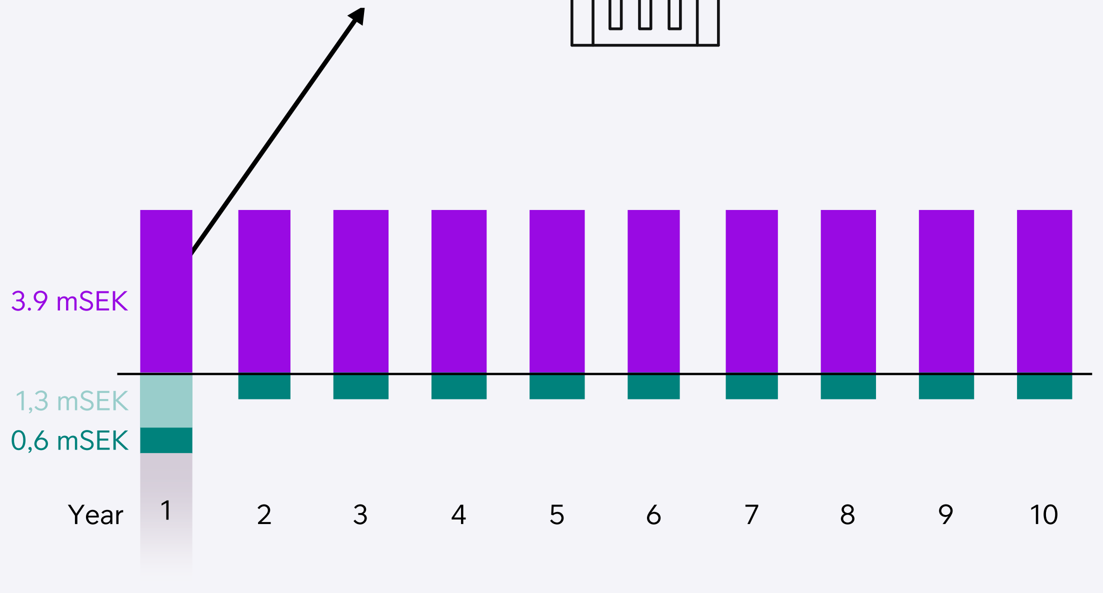
Portfolio of Residential Buildings

- 35 properties: 140,000 m²
- Northern Europe
- Low digital maturity
- Building pre-1965



Portfolio of Commercial Buildings[3]

- 38 properties: 190,000 m²
- Northern Europe
- Low digital maturity
- Buildings pre-1965



	Single Residential Building	Portfolio of Residential Buildings	Portfolio of Commercial Buildings[3]
Estimated decrease in energy consumption per year	**~14%**	**~14%**	**~14%**
Estimated decrease in annual energy costs	~88 kSEK[1]	~3,091 kSEK[1]	~3,674 kSEK[4]
Estimated decrease in annual costs from on-site visits	~7 kSEK	~226 kSEK	~245 kSEK
Total estimated decrease in operational costs	**~95 kSEK**	**~3.3 mSEK**	**~3.9 mSEK**
Estimated decrease in CO2eq* emissions per year	**~4 tonnes CO2eq**[2] (range between 0.8–14.8 tonnes CO2eq)	**~141 tonnes CO2eq**[2] (range between 27.1–518.9 tonnes CO2eq)	**~168 tonnes CO2eq**[5] (typically range between 32.2–615.7 tonnes CO2eq)
Time to break-even point	**~1 year**	**~1 year**	**~1 year**

***CO2eq** is a metric measure used to compare the emissions from various greenhouse gases on the basis of their global warming potential.

Residential buildings:
All figures are based on the baseline property owner.
1) Please note additional investments are required to reach full value, e.g. optimizing radiators.
2) Assuming an average emission of 52 g CO2/kWh and that district heating is the primary method of heating, the average emission intensity in Sweden. Studies have shown a span of 10–191 g/kWh depending on the provider, which would imply emission reductions within the span provided.

Commercial buildings:
Figures are based on the baseline commercial property. 3) Commercial buildings encompass public spaces like libraries, offices, and schools, while buildings such as malls or stores are not in scope. 4) Additional investments are required for full realization of value. For example, reducing heat leaks by replacing windows. Decreased energy costs are may accrue property owners or tenants depending on contract. 5) Assumes 52 g CO2/kWh average emission with district heating in Sweden.

Calculation: Heating Optimization

Additional benefits – tenant satisfaction and facility management:

A more stable indoor climate that is optimized for comfort as well as cost effectivenes.

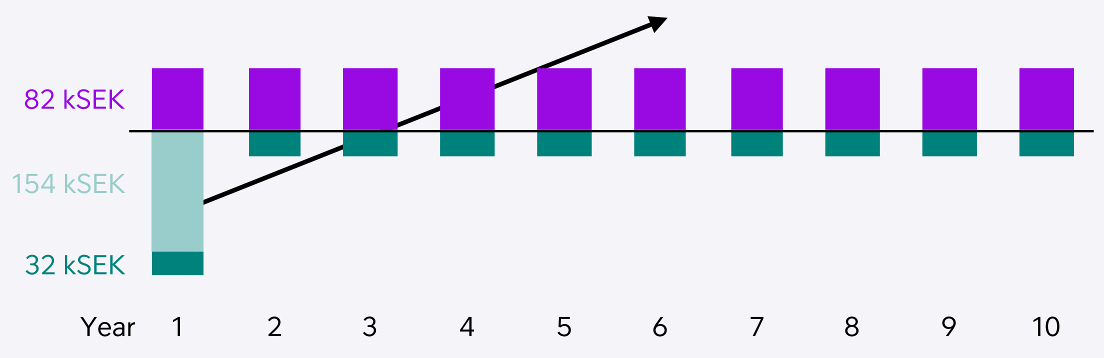
Heating Optimization provides a real-time temperature feed from different parts of a building to enable district heating to be regulated and optimized. This enables significant energy and costs savings while reducing CO2 emissions and increasing tenant comfort and satisfaction.

See page 15 to learn more about the calculation

Use case value | CAPEX (inc. VAT) | OPEX (inc. VAT) | Accumulated net value

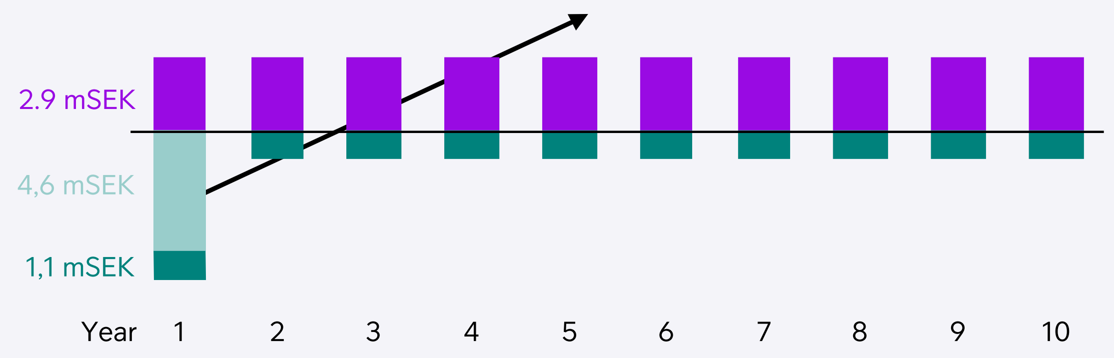
Single Residential Building

- 1 property: 4,000 m²
- Northern Europe
- Low digital maturity
- Building pre-1965



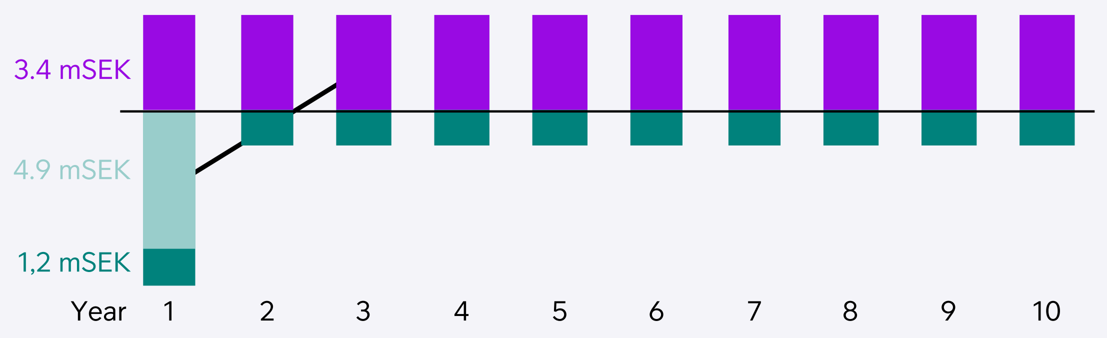
Portfolio of Residential Buildings

- 35 properties: 140,000 m²
- Northern Europe
- Low digital maturity
- Buildings pre-1965



Portfolio of Commercial Buildings[2]

- 38 properties: 190,000 m²
- Northern Europe
- Low digital maturity
- Buildings pre-1965



	Single Residential Building	Portfolio of Residential Buildings	Portfolio of Commercial Buildings[2]
Estimated decrease in energy consumption per year	~13%	~13%	~13%
Estimated decrease in annual energy costs	~82 kSEK	~2.9 mSEK	~3.4 mSEK[3]
Estimated decrease in CO2eq* emissions per year	~3.7 tonnes CO2eq[1] (range between 0.7–13.7 tonnes CO2eq)	~130.9 tonnes CO2eq[1] (range between 25.2–480.9 tonnes CO2eq)	~155.6 tonnes CO2eq[4] (typically range between 29.9–571.6 tonnes CO2eq)
Time to break-even point	~3 years	~3 years	~2 years

***CO2eq** is a metric measure used to compare the emissions from various greenhouse gases on the basis of their global warming potential.

Residential buildings:
All figures are based on the baseline property owner.
1) Assuming an average emission of 52 g CO2/kWh and that district heating is the primary method of heating, the average emission intensity in Sweden. Studies have shown a span of 10–191 g/kWh depending on the provider, which would imply emission reductions within the span provided.

Commercial buildings:
Figures are based on the baseline commercial property. 2) Commercial buildings encompass public spaces like libraries, offices, and schools, while buildings such as malls or stores are not in scope. 3) Additional investments are required for full realization of value. For example, reducing heat leaks by replacing windows. Decreased energy costs are may accrue property owners or tenants depending on contract. 4) Assumes 52 g CO2/kWh average emission with district heating in Sweden.

Calculation: Air Quality Monitoring

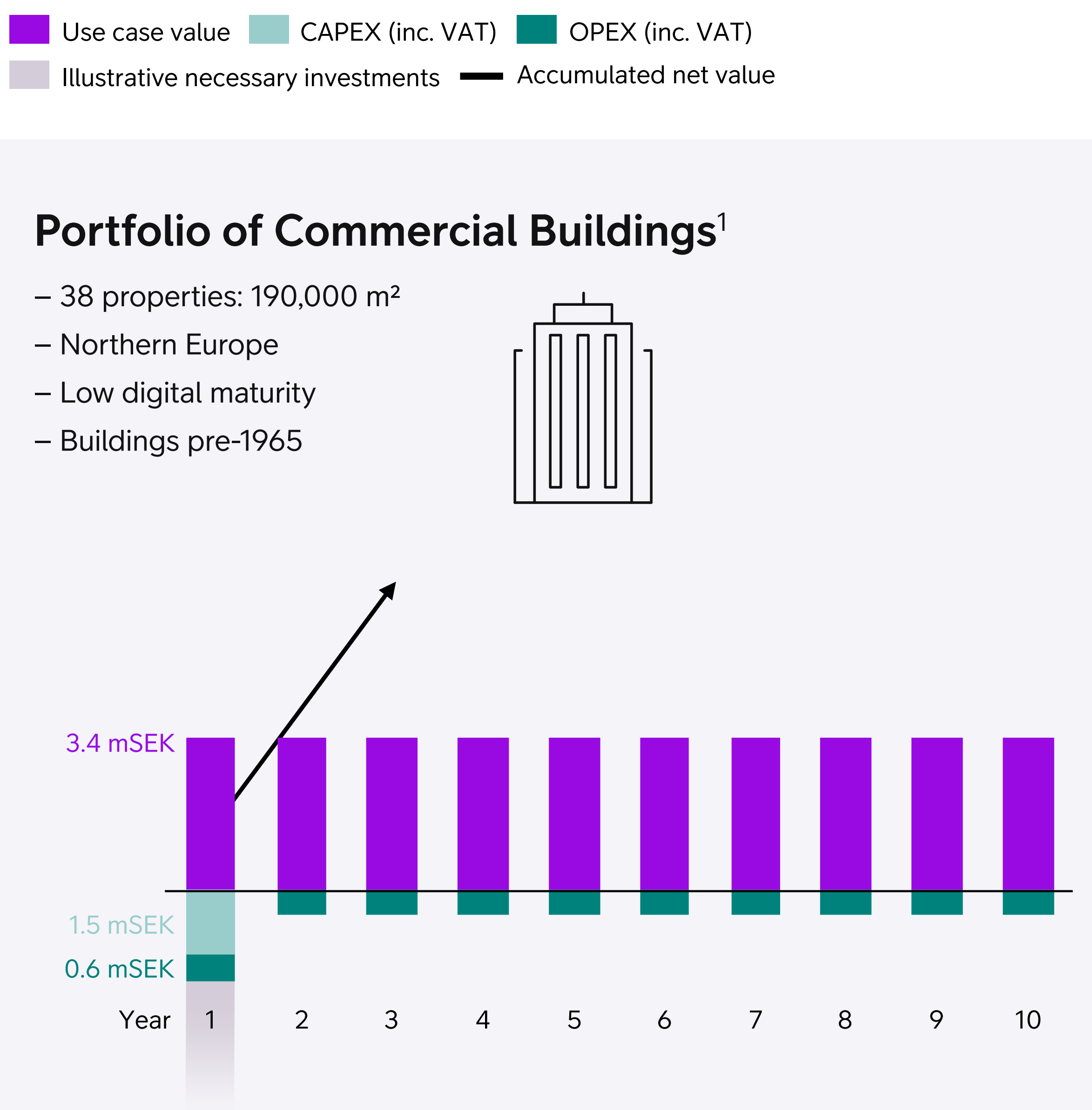
Indoor Air Quality Monitoring provides real-time information on temperature, humidity, CO2, VOC, and air pressure. This enables building owners to provide a healthier and more comfortable indoor climate for tenants. By gathering temperature insights from throughout the building, building managers can also gain insights into where temperature hot-spots and cold-spots are in the building and take proactive steps to reduce energy consumption, costs, and CO2 emissions.

See page 15 to learn more about the calculation

Note: Additional investments required to realize ICM energy efficiency gains. For example, window renovations to reduce heat leaks. Not included in net value calculation.

Portfolio of Commercial Buildings[1]

– 38 properties: 190,000 m²
– Northern Europe
– Low digital maturity
– Buildings pre-1965



	Estimated decrease in energy consumption per year	~13%
	Estimated decrease in annual energy costs[2]	~3.4 mSEK
	Estimated decrease in CO2eq* emissions per year[3]	~155.6 tonnes CO2eq (range between 29.9–571.6 tonnes CO2eq)
	Time to break-even point	~1 year

*CO2eq is a metric measure used to compare the emissions from various greenhouse gases on the basis of their global warming potential.

Commercial buildings:
Figures are based on the baseline commercial property.
1) Commercial buildings encompass public spaces like libraries, offices, and schools, while buildings such as malls or stores are not in scope.
2) Additional investments are required for full realization of value. For example, reducing heat leaks by replacing windows. Decreased energy costs are may accrue property owners or tenants depending on contract.
3) Assumes 52 g CO2/kWh average emission with district heating in Sweden.

Additional benefits:

- Comprehensive building data to enable data-driven decision making.
- A more comfortable indoor climate for both tenants and visitors.
- Idenitfying areas that can benefit from proactive action and predictive maintenance.

IoT Maturity ladder

70 percent of building owners are still in the early stages of their IoT journey.

However, they can swiftly **move up the IoT maturity ladder** with the right support, gradually seizing the benefits of IoT-enabled solutions.

1. Initiating

- Data supports manual decision making for certain use cases.
- Devices and systems are connected.
- IoT prototyping.
- Few different systems are communicating.

2. Exploratory

- Data is collected and visualized.
- Several pilot projects.
- IoT platform is launched.
- Some different systems are communicating.
- Data is a part of the daily monitoring and follow-up.

3. Enabling

- Data is used to model and simulate.
- Use of open APIs make it easier to share data and implement new services.
- The building communicates with its users and adapts to their behavior and preferences.
- Technical infrastructure that enables higher maturity.

4. Integrated & predictive

- IoT is used to innovate.
- IoT is integrated in most systems in the building.
- The building predicts future state based on direct and indirect data from its surrounding and users, and adapts or gives orders accordingly.
- Users get personal information and guidance.

5. Optimizing & cognitive

- IoT is used to transform.
- The building is self-teaching and uses machine learning to improve its prediction models and operations.
- The building communicates with nearby buildings, infrastructure and surrounding environment.

How to start unlocking your building's potential

The most important part of getting started is — getting started. Rather than waiting until you have solved every potential issue on paper — start with something small and manageable so you can learn as you scale. But balance a fast start with putting in place foundations that you can actually scale further down the track.

Whether you're just starting your digitalization journey, or want to make your smart buildings even smarter, it always helps to see what's possible and to be able to show others what's possible. A great place to start is with an interactive demo.

Contact us for more information:
iot-sales@teliacompany.com

Get our Smart Building guide

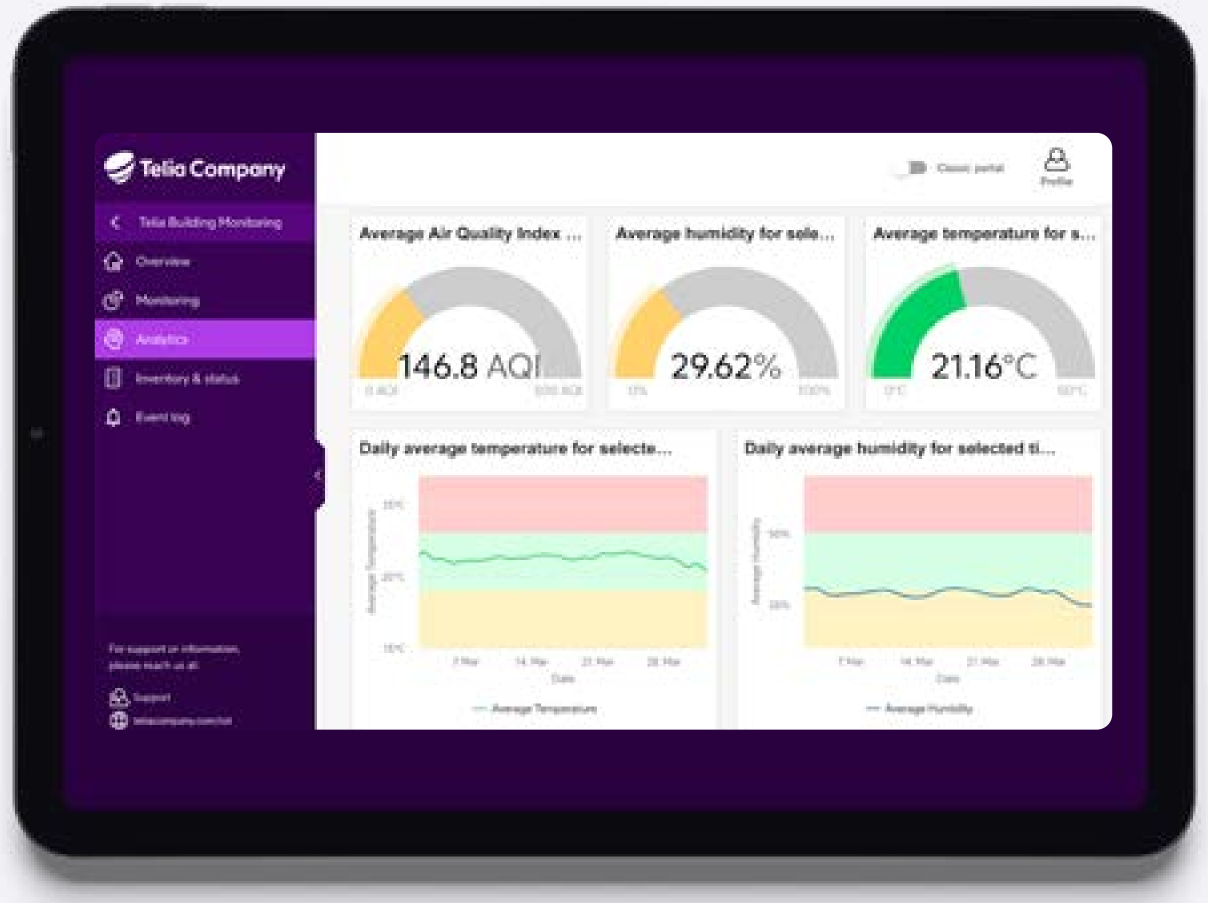
Download our Smart Building guide to learn about the why, what and how of a smart building.

Learn more here

Telia Smart Building

Transform your building without moving a brick

Telia Smart Building is a suite of digitalization tools and services for new and existing buildings. It enables building owners and managers to monitor and optimize building operations, reduce costs and increase sustainability. It also creates a more healthy and comfortable environment for tenants as well as giving them new smart services to simplify their day-to-day lives. Book a demo.



Building Monitoring
Monitor your building in real time and gain deep insights into how to make it more energy efficient, comfortable, sustainable and profitable.

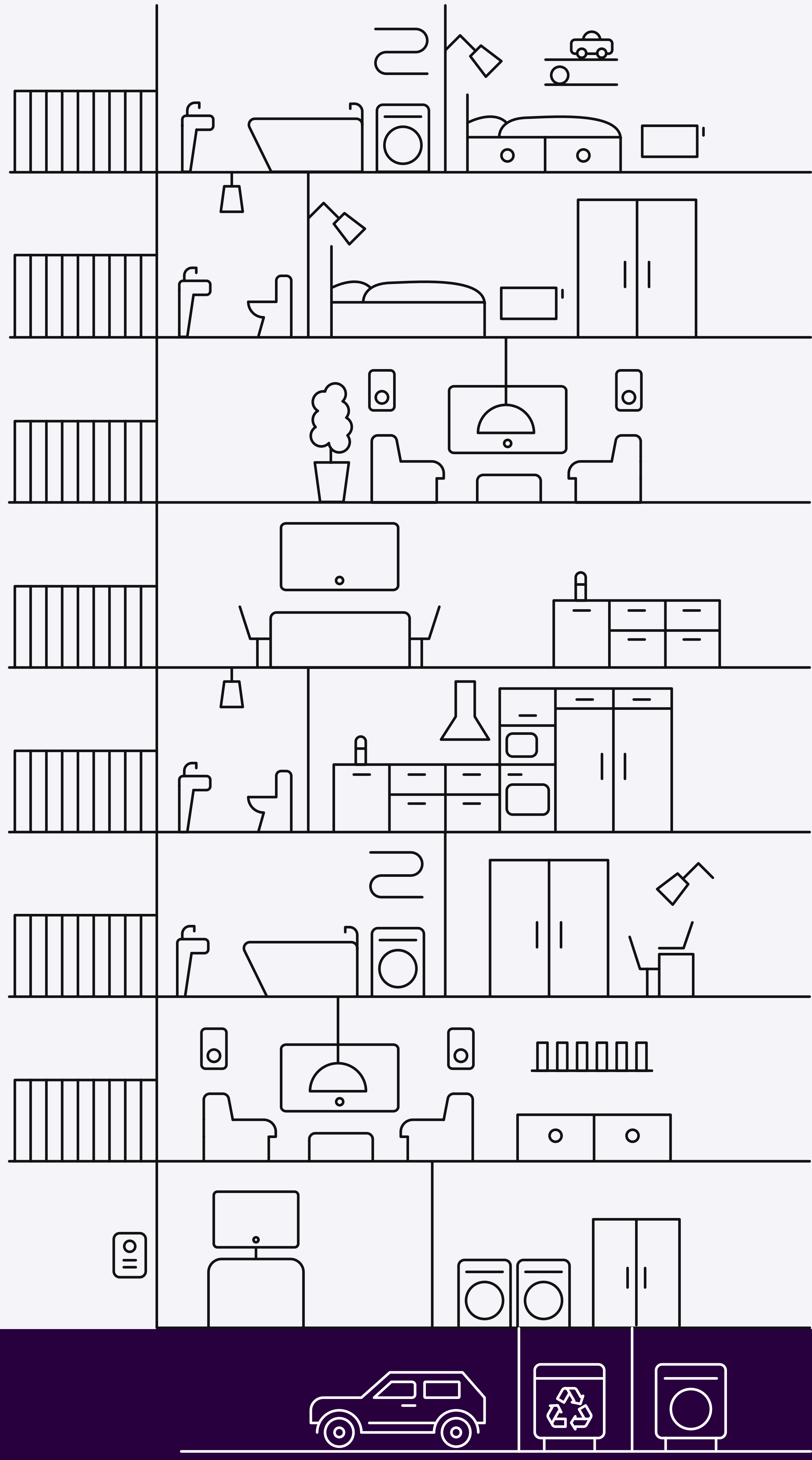
Smart Living
Connect your tenants' fire and water leakage alarms and give them 'smart' services to simplify their day-to-day lives.

Crowd Insight
Gain location insights from crowd movement patterns: how many people, where and when from anonymized and aggregated mobile network data and WiFi probe data.

Real estate IT
Consolidate and secure your IT infrastructure to maximize building IT efficiency and minimize network life cycle cost.

Communication infrastructure
Futureproof your building with open fiber to let your tenants choose their providers – and offer them the leading TV, phone and broadband packages as well.

Real estate WiFi
Connect all your commercial tenants with fast and reliable WiFi throughout your building so they can stay seamlessly connected.



Telia IoT Platform
Collect, store and visualize your building data for real-time monitoring and optimization. Then unlock insights to enable predictive maintenance and new revenue and service opportunities. With an open API you can integrate your BMS data and third party data to gain a full overview of your building.

Indoor Climate Monitoring

Baseline calculation: Single Residential Building

Energy Savings

Average annual energy cost
One building approximately 4,000 m^2
Average kWh use per m^2 and year: 138 kWh[1]
Average price per kWh: ~1.14 SEK[2]
Average annual energy cost: ~630 kSEK

Energy reduction from deploying Indoor Climate Monitoring
As energy efficiency varies depending on the year the building was constructed, we used a baseline of a building built before 1965. Derived from previous projects, and benchmarked against other solutions in the market. Energy reduction: **14%**[3]
Potential energy cost savings from deploying Indoor Climate Monitoring: ~88 kSEK per year

Reducing unnecessary site visits

Responding to tenant complaints about temperature by checking and adjusting temperature remotely rather than making an on-site visit.

Cost of incorrect temperature
One building approximately 4,000 m^2
Cost per visit: ~475 SEK
Number of temperature related site visits per year: 17
Reduction in number of site visits required: 80%[4]
Potential cost savings from reduction of unnecessary site visits: ~6.5 kSEK per year

Deployment costs (inc. VAT)

Installment of sensors and onboarding of the equipment (CAPEX): **~59 kSEK**
Service fee for ongoing operation (OPEX): **~15 kSEK**
Note: These costs cover only Indoor Climate Monitoring. To fully deploy the solution, building owners would need to make additional investments.
Payback time: ~1 year

CO2 Reduction

Energy consumption X CO2 generated X energy reduction

Average annual energy consumption
One building approximately 4,000 m^2
Average kWh use per m^2 and year: 138 kWh[1]
Average annual energy consumption: **~553 k kWh**

CO2 generated
CO2 equivalent (CO2eq) is a metric measure used to compare the emissions from various greenhouse gases on the basis of their global warming potential. The amount of CO2 generated depends on the mix of energy sources used in each building. A 2019 study by Fastighetsägarna looking at the emissions generated by 16 district heating providers found a span of 10–191 g/kWh of CO2eq. The most sustainable providers are found at the lower end of this span while those with a larger share of fossil fuels are at the top.

Although this data is specific to Sweden, because most Nordic and Baltic countries use a large share of renewables in their district heating, this figure can be considered applicable across the region. Finland is the exception, where a larger share of fossil fuels is used in district heating, leading to higher emissions — and higher potential emission reduction. In this example, we have used **52 g/kWh**[5]

Annual CO2 reduction: ~4 tonnes — with a wider span of 0.8–14.6 tonnes

[1] Average kWh use per m2 and year: Energimyndigheten.
[2] Average price per kWh: Energimarknadsbyrån.
[3] Energy reduction: Telia, KTC.
[4] Ericsson study.
[5] Average CO2 per kWh: KTC, IEA, Fastighetsägarna.

Indoor Climate Monitoring

Baseline calculation: Portfolio of Residential Buildings

Energy Savings

Average annual energy cost
35 buildings approximately 4,000 m^2 each
Average kWh use per m^2 and year: 138 kWh[1]
Average price per kWh: ~1.14 SEK[2]
Average annual energy cost: ~22 mSEK

Energy reduction from deploying Indoor Climate Monitoring
As energy efficiency varies depending on the year the building was constructed, we used a baseline of a building built before 1965. Derived from previous projects, and benchmarked against other solutions in the market. Energy reduction: **14%**[3]
Potential energy cost savings from deploying Indoor Climate Monitoring: ~3,091 kSEK per year

Reducing unnecessary site visits

Responding to tenant complaints about temperature by checking and adjusting temperature remotely rather than making an on-site visit.

Cost of incorrect temperature
One building approximately 4,000 m^2
Cost per visit: ~475 SEK
Number of temperature related site visits per year: 595
Reduction in number of site visits required: 80%[4]
Potential cost savings from reduction of unnecessary site visits: ~226 kSEK per year

Deployment costs (inc. VAT)

Installment of sensors and onboarding of the equipment (CAPEX): **~1.2 mSEK**
Service fee for ongoing operation (OPEX): **~533 kSEK**
Note: These costs cover only Indoor Climate Monitoring. To fully deploy the solution, building owners would need to make additional investments.
Payback time: ~1 year

CO2 Reduction

Energy consumption X CO2 generated X energy reduction

Average annual energy consumption
One building approximately 4,000 m^2
Average kWh use per m^2 and year: 138 kWh[1]
Average annual energy consumption: **~19 m kWh**

CO2 generated
CO2 equivalent (CO2eq) is a metric measure used to compare the emissions from various greenhouse gases on the basis of their global warming potential. The amount of CO2 generated depends on the mix of energy sources used in each building. A 2019 study by Fastighetsägarna looking at the emissions generated by 16 district heating providers found a span of 10–191 g/kWh of CO2eq. The most sustainable providers are found at the lower end of this span while those with a larger share of fossil fuels are at the top. Although this data is specific to Sweden, because most Nordic and Baltic countries use a large share of renewables in their district heating, this figure can be considered applicable across the region. Finland is the exception, where a larger share of fossil fuels is used in district heating, leading to higher emissions — and higher potential emission reduction. In this example, we have used **52 g/kWh**[5]

Annual CO2 reduction: ~141 tonnes — with a wider span of 27–519 tonnes

[1] Average kWh use per m^2 and year: Energimyndigheten.
[2] Average price per kWh: Energimarknadsbyrån.
[3] Energy reduction: Telia, KTC.
[4] Ericsson study.
[5] Average CO2 per kWh: KTC, IEA, Fastighetsägarna.

Indoor Climate Monitoring

Baseline calculation: Portfolio of Commercial Buildings

Energy Savings

Average annual energy cost
38 buildings approximately 5,000 m^2 each
Average kWh use per m^2 and year: 121 kWh[1]
Average price per kWh: ~1.14 SEK[2]
Average annual energy cost: ~26 mSEK

Energy reduction from deploying Indoor Climate Monitoring
As energy efficiency varies depending on the year the building was constructed, we used a baseline of a building built before 1965. Derived from previous projects, and benchmarked against other solutions in the market. Energy reduction: **14%**[3]
Potential energy cost savings from deploying Indoor Climate Monitoring: ~3,674 kSEK per year

Reducing unnecessary site visits

Responding to tenant complaints about temperature by checking and adjusting temperature remotely rather than making an on-site visit.

Cost of incorrect temperature
Cost per visit: ~475 SEK
Number of temperature related site visits per year: 646
Reduction in number of site visits required: 80%[4]
Potential cost savings from reduction of unnecessary site visits: ~245 kSEK per year

Deployment costs (inc. VAT)

Installment of sensors and onboarding of the equipment (CAPEX): **~1.3 mSEK**
Service fee for ongoing operation (OPEX): **~579 kSEK**
Note: These costs cover only Indoor Climate Monitoring. To fully deploy the solution, building owners would need to make additional investments.
Payback time: ~1 year

CO2 Reduction

Energy consumption X CO2 generated X energy reduction

Average annual energy consumption
One building approximately 5,000 m^2
Average kWh use per m^2 and year: 121 kWh[1]
Average annual energy consumption: **~23 m kWh**

CO2 generated
CO2 equivalent (CO2eq) is a metric measure used to compare the emissions from various greenhouse gases on the basis of their global warming potential. The amount of CO2 generated depends on the mix of energy sources used in each building. A 2019 study by Fastighetsägarna looking at the emissions generated by 16 district heating providers found a span of 10–191 g/kWh of CO2eq. The most sustainable providers are found at the lower end of this span while those with a larger share of fossil fuels are at the top. Although this data is specific to Sweden, because most Nordic and Baltic countries use a large share of renewables in their district heating, this figure can be considered applicable across the region. Finland is the exception, where a larger share of fossil fuels is used in district heating, leading to higher emissions — and higher potential emission reduction. In this example, we have used **52 g/kWh**[5]

Annual CO2 reduction: ~168 tonnes — with a wider span of 22–616 tonnes

[1] Average kWh use per m^2 and year: Energimyndigheten.
[2] Average price per kWh: Energimarknadsbyrån.
[3] Energy reduction: Telia, KTC.
[4] Ericsson study.
[5] Average CO2 per kWh: KTC, IEA, Fastighetsägarna.

Heating Optimization

Single Residential Building using district heating

Energy Savings

Average annual energy cost
One building approximately 4,000 m^2
Average kWh use per m^2 and year: 138 kWh[1]
Average price per kWh: ~1.14 SEK[2]
Average annual energy cost: **~630 kSEK**

Energy reduction from deploying Heating Optimization
As energy efficiency varies depending on the year the building was constructed, we used a baseline of a building built before 1965. Derived from previous projects, and benchmarked against other solutions in the market.
Energy reduction: **13%**[3]
Calculated cost savings from deploying Heating Optimization: ~82 kSEK per year

Deployment costs (inc. VAT)

Installment of sensors and onboarding of the equipment (CAPEX): **~154 kSEK**
Service fee for ongoing operation (OPEX): ~**32 kSEK**
Payback time: ~3 years

CO2 Reduction

Energy consumption X CO2 generated X energy reduction

Average annual energy consumption
One building approximately 4,000 m^2
Average kWh use per m^2 and year: 138 kWh[1]
Average annual energy consumption: **~553 k kWh**

CO2 generated
CO2 equivalent (CO2eq) is a metric measure used to compare the emissions from various greenhouse gases on the basis of their global warming potential. The amount of CO2 generated depends on the mix of energy sources used in each building. A 2019 study by Fastighetsägarna looking at the emissions generated by 16 district heating providers found a span of 10–191 g/kWh of CO2eq. The most sustainable providers are found at the lower end of this span while those with a larger share of fossil fuels are at the top.

Although this data is specific to Sweden, because most Nordic and Baltic countries use a large share of renewables in their district heating, this figure can be considered applicable across the region. Finland is the exception, where a larger share of fossil fuels is used in district heating, leading to higher emissions — and higher potential emission reduction. In this example, we have used **52 g/kWh**[4]

Energy reduction from deploying Heating Optimization
As per above: **~13%**[3]
Annual CO2 reduction: ~3.7 tonnes — with a wider span of 0.7–13.7 tonnes

[1] Average kWh use per m^2 and year: Energimyndigheten.
[2] Average price per kWh: Energimarknadsbyrån.
[3] Energy reduction: Telia, KTC.
[4] Average CO2 per kWh: KTC, IEA, Fastighetsägarna.

Heating Optimization

Portfolio of Residential Buildings using district heating

Energy Savings

Average annual energy cost
35 buildings approximately 4,000 m^2 each
Average kWh use per m^2 and year: 138 kWh[1]
Average price per kWh: ~1.14 SEK[2]
Average annual energy cost: **~21 mSEK**

Energy reduction from deploying Heating Optimization
As energy efficiency varies depending on the year the building was constructed, we used a baseline of buildings built before 1965. Derived from previous projects and benchmarked against other solutions in the market.
Energy reduction: **13%**[3]
Calculated cost savings from deploying Heating Optimization: ~2.9 mSEK per year

Deployment costs (inc. VAT)

Installment of sensors and onboarding of the equipment (CAPEX): **~4.6 mSEK**
Service fee for ongoing operation (OPEX): ~**1.1 mSEK**
Payback time: ~2.5 years

CO2 Reduction

Energy consumption X CO2 generated X energy reduction

Average annual energy consumption
35 buildings approximately 4,000 m^2 each
Average kWh use per m^2 and year: 138 kWh[1]
Average annual energy consumption: **~19.3 m kWh**

CO2 generated
CO2 equivalent (CO2eq) is a metric measure used to compare the emissions from various greenhouse gases on the basis of their global warming potential. The amount of CO2 generated depends on the mix of energy sources used in each building. A 2019 study by Fastighetsägarna looking at the emissions generated by 16 district heating providers found a span of 10–191 g/kWh of CO2eq. The most sustainable providers are found at the lower end of this span while those with a larger share of fossil fuels are at the top.

Although this data is specific to Sweden, because most Nordic and Baltic countries use a large share of renewables in their district heating, this figure can be considered applicable across the region. Finland is the exception, where a larger share of fossil fuels is used in district heating, leading to higher emissions — and higher potential emission reduction. In this example, we have used **52 g/kWh**[4]

Energy reduction from deploying Heating Optimization:
as per above: **~13%**[3]
Annual CO2 reduction: ~131 tonnes — with a wider span of 25–481 tonnes

[1] Average kWh use per m^2 and year: Energimyndigheten.
[2] Average price per kWh: Energimarknadsbyrån.
[3] Energy reduction: Telia, KTC.
[4] Average CO2 per kWh: KTC, IEA, Fastighetsägarna.

Heating Optimization

Portfolio of Commercial Buildings using district heating

Energy Savings

Average annual energy cost
38 buildings approximately 5,000 m^2 each
Average kWh use per m^2 and year: 121 kWh[1]
Average price per kWh: ~1.14 SEK[2]
Average annual energy cost: **~26.2 mSEK**

Energy reduction from deploying Heating Optimization
As energy efficiency varies depending on the year the building was constructed, we used a baseline of buildings built before 1965. Derived from previous projects and benchmarked against other solutions in the market.
Energy reduction: **13%**[3]
Calculated cost savings from deploying Heating Optimization: ~3.4 mSEK per year

Deployment costs (inc. VAT)

Installment of sensors and onboarding of the equipment (CAPEX): **~ 4.9 mSEK**
Service fee for ongoing operation (OPEX): ~**1.2 mSEK**
Payback time: ~2 years

CO2 Reduction

Energy consumption X CO2 generated X energy reduction

Average annual energy consumption
38 buildings approximately 5,000 m^2 each
Average kWh use per m^2 and year: 121 kWh[1]
Average annual energy consumption: **~26.2 m kWh**

CO2 generated
CO2 equivalent (CO2eq) is a metric measure used to compare the emissions from various greenhouse gases on the basis of their global warming potential. The amount of CO2 generated depends on the mix of energy sources used in each building. A 2019 study by Fastighetsägarna looking at the emissions generated by 16 district heating providers found a span of 10–191 g/kWh of CO2eq. The most sustainable providers are found at the lower end of this span while those with a larger share of fossil fuels are at the top.

Although this data is specific to Sweden, because most Nordic and Baltic countries use a large share of renewables in their district heating, this figure can be considered applicable across the region. Finland is the exception, where a larger share of fossil fuels is used in district heating, leading to higher emissions — and higher potential emission reduction. In this example, we have used **52 g/kWh**[4]

Energy reduction from deploying Heating Optimization:
as per above: **~13%**[3]
Annual CO2 reduction: ~156 tonnes — with a wider span of 30–572 tonnes

[1] Average kWh use per m^2 and year: Energimyndigheten.
[2] Average price per kWh: Energimarknadsbyrån.
[3] Energy reduction: Telia, KTC.
[4] Average CO2 per kWh: KTC, IEA, Fastighetsägarna.

Indoor Air Quality Monitoring

Portfolio of Commercial Buildings

Energy Savings

Average annual energy cost
38 buildings approximately 5,000 m^2 each
Average kWh use per m^2 and year: 121 kWh[1]
Average price per kWh: ~1.14 SEK[2]
Average annual energy cost: **~26.2 mSEK**

Energy reduction from deploying Indoor Air Quality Monitoring
As energy efficiency varies depending on the year the building was constructed, we used a baseline of buildings built before 1965. Derived from previous projects and benchmarked against other solutions in the market.
Energy reduction: **13%**[3]
Calculated cost savings from deploying Indoor Air Quality Monitoring: ~3.4 mSEK per year

Deployment costs (inc. VAT)

Installment of sensors and onboarding of the equipment (CAPEX): **~1.5 mSEK**
Service fee for ongoing operation (OPEX): ~**579 kSEK**
Note: These costs cover only Indoor Air Quality Monitoring. To fully deploy the solution, building owners would need to make additional investments.
Payback time: ~1 year

CO2 Reduction

Energy consumption X CO2 generated X energy reduction

Average annual energy consumption
35 buildings approximately 5,000 m^2 each
Average kWh use per m^2 and year: 121 kWh[1]
Average annual energy consumption: **~23 m kWh**

CO2 generated
CO2 equivalent (CO2eq) is a metric measure used to compare the emissions from various greenhouse gases on the basis of their global warming potential. The amount of CO2 generated depends on the mix of energy sources used in each building. A 2019 study by Fastighetsägarna looking at the emissions generated by 16 district heating providers found a span of 10–191 g/kWh of CO2eq. The most sustainable providers are found at the lower end of this span while those with a larger share of fossil fuels are at the top.

Although this data is specific to Sweden, because most Nordic and Baltic countries use a large share of renewables in their district heating, this figure can be considered applicable across the region. Finland is the exception, where a larger share of fossil fuels is used in district heating, leading to higher emissions — and higher potential emission reduction. In this example, we have used **52 g/kWh**[4]

Energy reduction from deploying Indoor Air Quality Monitoring:
as per above: **~13%**[3]
Annual CO2 reduction: ~156 tonnes — with a wider span of 30–571 tonnes

[1] Average kWh use per m^2 and year: Energimyndigheten.
[2] Average price per kWh: Energimarknadsbyrån.
[3] Energy reduction: Telia, KTC.
[4] Average CO2 per kWh: KTC, IEA, Fastighetsägarna.

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