

FOR ENERGY EFFICIENT INVESTMENTS



GUIDE FOR MUNICIPAL DECISION-MAKERS

MUNICIPALITIES AS PROPERTY OWNERS

Properties play an important role in the everyday life of municipalities' residents and the municipality's economy. Municipalities own, acquire, maintain and use properties. Municipalities decide on the construction, repair, non-repair and destruction of buildings. Buildings exist for the users and implementers of services provided by the municipality. The prerequisites of the good implementation of services and the users' needs change quickly. For example, population development and digitalisation strongly effect the user needs of facilities. In addition, the Social and health system reform has a significant effect on the municipalities' property maintenance.

In challenging operating environments, municipalities require good owner guidance. The mere financial perspective is not sufficient, but instead a balance between the users' needs, lifecycle thinking and climate requirements must be found.

The purpose of this guide is to offer information for considering, when energy efficiency may be a good solution for the development of municipal operations.

CLIMATE CHANGE AS A CHALLENGE

Municipalities are important operators in the control of climate change. Greenhouse gas emissions can be reduced mostly in properties' energy economy and traffic. By changing personal operating methods, only part of overall emissions can be affected, so the solutions municipal residents and companies make are important. By means of guidance and advice, as well as by means of setting an example, a municipality can influence the area's operators.

Finland has committed to reducing greenhouse gas emissions by improving the energy efficiency of buildings and increasing the use of renewable energy. In our country, the heating energy consumption of buildings is the main individual contributor of greenhouse gas emissions, and thus climate change. A new building must be built according to existing regulations as an almost zero-energy building, which means a building that is extremely energy efficient and the energy required by it is increasingly often obtained from renewable sources. The energy efficiency of new buildings has been improved by increasing the thermal insulation, sealing the structures and increasing the efficiency of ventilation heat recovery.

The energy efficiency regulations of renovation construction are applied in projects that are subject to permits, in other words when there is a need to complete a repair project that is subject to a permit, the requirements concerning the improvement of energy efficiency must also be considered.

Energy efficient solutions require an understanding of the structures' physics and even more careful and error-free implementation at the construction site. The use of building automation services must also be appropriate for the duration of the building's life cycle.

Source: State of the Built Environment: Finland 2017. ROTI 2017 report, <https://ilmasto-opas.fi/>

MUNICIPALITIES' OFFICE PROPERTY AND INDOOR AIR ISSUES

Approximately 85% of school buildings in municipalities have been built before the 1990s. Wide-scale renovations of schools have often been postponed and replaced with small annual repairs, which is probably one significant reason for the occurrence of indoor air problems. An issue of debate, which has been covered a lot, is aimed to be resolved, i.e. the implementation of the Healthy Premises 2028 programme was initiated by the government in 2018. The aim of the programme is to make public buildings healthy and improve the care and rehabilitation of people suffering from indoor air symptoms. During the term of the programme, a practice is established for the property management, in which the condition of the buildings, the suitability for its intended use and user experiences are regularly reviewed and assessed.

In terms of an individual municipality, the treatment of indoor air problems is linked to both property management practices and the management of office property. It is easier to decide on procedures that must be completed and any possible investment when the condition and energy consumption of the relevant property, as well as its position in the municipality's office programme is known.

The Healthy Premises 2028 programme supports the identification and consideration of properties' operational requirements, the development of buildings' good maintenance practices, guidelines related to the moisture management of construction as well as good practice implementation models and the development of municipalities' skills.

MANAGEMENT OF MUNICIPALITIES' BUILDING PROPERTY

The reorganisations of operations, municipal mergers as well as the reform of provincial administration effect the needs and future of municipalities' property stock. An active owner policy, data-based decision-making, topical property and office strategies, as well as the mutual service network plans of surrounding municipalities guide towards long-term operations. Good office property management is also a prerequisite for being able to produce users good property services and for finding the right subjects for energy efficiency solutions.

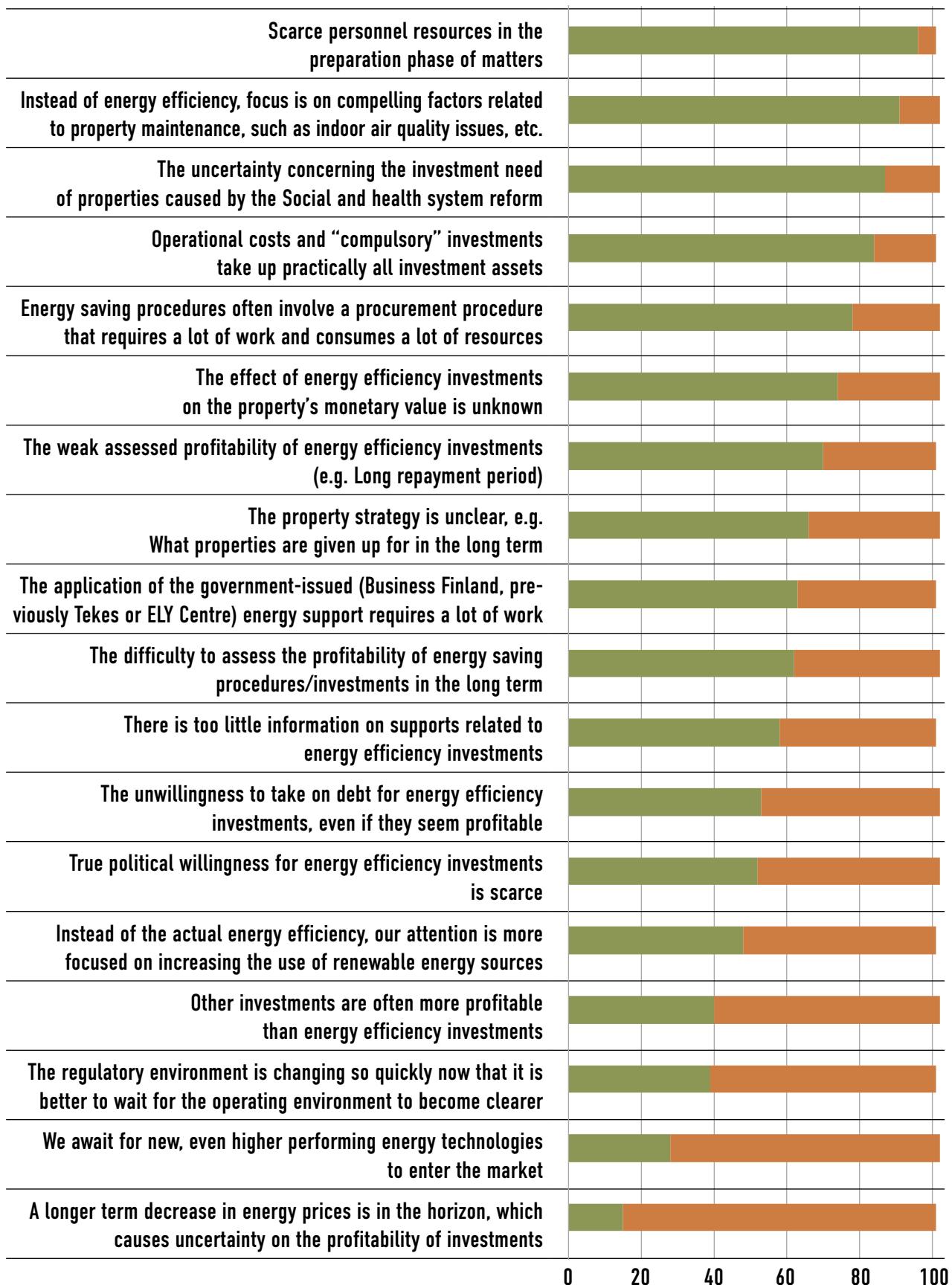
Source: <https://docplayer.fi/18168790-Harkittua-omistajuutta-toimitiloihin-paattajaohje-kuntakonservien-tilaomaisuuden-hallintaan.html>, Municipalities' savings potential in building stock, Government's survey and research operations' publication series 5/2018.

Healthy premises 2028 is an action programme prepared by the government to solve the indoor air problems of public buildings.

Source: <https://vnk.fi/terveet-tilat-2028>



MUNICIPAL STRATEGY	<p>The government decides on the objectives of a municipality's operations and economy.</p> <p>Guidelines are determined for the repairs of municipal properties and energy efficiency investments.</p>	<p>Principles on the use of premises</p> <p>Repair principles of premises</p> <p>Operational and financial objectives for various operations</p>
OWNER GUIDANCE	<p>The decision-maker is responsible for municipality's premises property. Consolidation of services and premises.</p>	<p>Retaining ownership value.</p> <p>Quality, profit and other objectives</p> <p>Social and environmental responsibility</p>
SERVICE PROGRAMMES	<p>Organisational, developmental and quality objectives for services are defined.</p> <p>Organisation of services in appropriate conditions.</p>	<p>Alignments on the organisational methods of services</p>
SERVICE NETWORKS	<p>Service networks are planned via multidisciplinary review.</p> <p>Possible regional cooperation.</p>	<p>Combines services and premises to each other.</p> <p>Operating model for property maintenance and the control of operations.</p>
PREMISES PROGRAMME	<p>Defines what and how a municipality wants to own, maintain and use properties.</p>	<p>Safe combination of premises and services</p>
PORTFOLIO MANAGEMENT	<p>A municipality's premises property is usually grouped in to 3–6 portfolios according to their future needs.</p> <p>Building groups in portfolios are prepared a proactive maintenance programme, which aims to avoid surprising problem situations, such as the formation of indoor air problems.</p>	<p>To be kept</p> <p>To be developed</p> <p>To be sold, demolished</p>



0 20 40 60 80 100

- Entirely or partially agree
- Entirely or partially disagree or don't know

Sykli's and Association of Finnish Local and Regional Authorities's survey on municipal premises for relevant officials and experts familiar in energy issues (2018). The precise question is > What are the worst obstacles for energy efficiency procedures and investments?

AWAY FROM ENERGY PARADOxes

An energy paradox refers to the fact that energy efficiency investments are considered to be profitable and important, but investment funds are still targeted on other - possibly less profitable - subjects. SYKLI studied the obstacles for energy efficiency investments together with the Association of Finnish Local and Regional Authorities as part of the EconomicE project in 2018 (the report is to be published). The municipalities that participated in the survey represented approximately three quarters of the municipalities' office stock. The obstacles for energy efficiency procedures and investments that were brought up in the survey included municipalities' insufficient personnel resources, difficult operating environment with its multiple simultaneous challenges, insufficient information on the profitability of investments and the effect on property value as well as the lack of a premises strategy.

Many of the obstacles experienced in municipalities are related to the lack of information and the uncertainty caused by rapid change. When administrative changes, hopefully in the near future, have been completed, the new situation will enable and facilitate the implementation of future-oriented solutions.

The available forms of energy and energy efficiency determine a lot in the municipality's economy and aim for a low-carbon footprint. Although the primary aim of a renovation or investment project might not be the increase of energy efficiency, the potential of energy improvements are always worth reviewing.

TOWARDS OBJECTIVES WITH AGREEMENTS AND COMMITMENTS

Several voluntary programmes and commitments are available to municipalities and cities, which allow to improve the energy and material efficiency of own activities and reduce environmental stress. The municipalities' energy efficiency agreement, HINKU operations and the FISU network offer good tools for making operations more efficient and for reducing carbon footprints. Municipalities also play a role in the initiation and growth of circular economy.

MUNICIPAL ENERGY EFFICIENCY AGREEMENT 2017-2025

The municipal energy efficiency agreement is an agreement concluded between the Ministry of Employment and the Economy, the Energy Authority and the Association of Finnish Local and Regional Authorities, concerning more efficient municipal use of energy. The energy efficiency agreement commits to the procedures and objectives of the municipal energy efficiency agreement. The aim of the agreements is to get companies and communities to continuously improve their energy efficiency. The agreement sets out an quantitative energy consumption efficiency objective and describes the implementation methods for achieving the objective. The energy efficiency agreement system mainly monitors the overall energy consumption at an annual level. Therefore, the overall energy consumption may increase with the increase of building stock, although the energy efficiency calculated per surface area may have reduced.

Source: <http://www.energiatehokkuussopimukset2017-2025.fi/>

CARBON-NEUTRAL MUNICIPALITY - HINKU AGREEMENTS

In the *Aiming for a carbon-neutral municipality* project, municipalities, companies, residents and experts generate ideas and mutually implement solutions for controlling greenhouse gas emissions. Hinku municipalities have agreed to aim for an 80 percent reduction in emissions from the level in 2007 by the year 2030.

Emissions are particularly reduced by improving energy efficiency and by increasing the use of renewable energy. In addition to the municipality's own operations, municipalities can influence e.g. emissions related to land use, energy production and traffic in the municipal area, with their own decisions. Alongside the reduction of emissions, the aim is to strengthen the local well-being by means of e.g. cost savings, energy self-sufficiency and new business opportunities.

Source: <http://www.syke.fi/hankkeet/hinku>

FISU NETWORK

Fisu (*Finnish Sustainable Communities*) is a network of pioneer municipalities, which aims for carbon neutrality, waste-freeness and globally sustainable consumption by the year 2050.

Operators in the Fisu network build a common vision and road map for achieving the objectives.

Source: <http://www.fisunetwork.fi/>





HOW IS THE ENERGY EFFICIENCY OF BUILDINGS IMPROVED?

Buildings' planning phase

In terms of efficiency, the best time for good energy efficiency is at the beginning of the building's life cycle, when the building is still on the planning board. At the same time, it is a good time to consider the maintainability and usability of the building. A euro invested in the planning of energy efficiency may provide several dozens times for savings during its life cycle.

Building's usage phase

During the usage phase of a building, one of the easiest and most cost-effective energy saving methods is to completely avoid the unnecessary consumption of energy. A significant result is already achieved by turning off lights, adjusting indoor temperatures and the necessary control of air-conditioning. A majority of buildings continue to have indoor temperatures that are unnecessarily high. Energy can be saved by, for example, reducing nighttime temperatures.

The appropriate control of ventilation is part of energy efficiency. Solutions are building-specific and are based on the buildings' design solutions, so it can be challenging to apply a common practice to all sites within the same municipality. Increasing the level of buildings' use in such a way that some buildings can be completely relinquished or the construction of a new property stock can be avoided, reduces the costs of energy and maintenance.

ENERGY EFFICIENCY INVESTMENTS

An investment need most often arises from another reason than for the improvement of energy efficiency. An investment decision or investment profitability should however always be assessed from an energy perspective too. The improvement of energy efficiency means savings that, when reviewing life cycle costs, can be significant. Indoor air problems are often connected to repair debt and insufficient maintenance. Municipalities' climate strategies and aims for carbon neutrality also require the improvement of energy efficiency or transferring to the use of renewa-

ble energy. An energy efficiency renovation combined with a general renovation can promote both the municipality's service capacity and climate objectives.

Energy efficiency projects can be grouped in three categories:

- 1) **Investments or repairs**, in which the primary objective is to improve energy efficiency and which involve the increase of buildings' thermal insulation properties (walls, upper and lower floors, doors and windows) in such a way that heat does not escape or flow out of the building.
- 2) **Renovation construction projects**, in which the renovated building and/or office is more energy efficient, which means that the heat energy leaving the building can be recovered and utilised.
- 3) **New buildings**, which are built according to recent building regulations.

When improving energy efficiency, other benefits, such as the reduction of greenhouse gas emissions, improvement of local air quality and improvement of environmental health, can be achieved, which are worth raising to attention when marketing an energy efficiency investment. Sites purely concerning the improvement of energy efficiency can be found in energy reviews related to energy efficiency agreements.

Source: Funding of energy efficiency - background research, Motiva 2018.

AN ENERGY EFFICIENCY RENOVATION IS WORTH IMPLEMENTING ANYWAY!

According to a study carried out by the government (2017), the building stock's computational savings potential of energy efficiency can vary significantly, depending on the objective. At its lowest, e.g. a 3% savings objective in energy efficiency would mean annual savings of 27m€ in municipal groups. The level can be achieved by developing operations, in other words by controlling lighting and ventilation.

When aiming for greater savings, significant investments are necessary.

Source: Korhonen, E., Niemi, J., Ekuri, R., Oksanen, R., Miettinen, H., Parviaainen, J., Haapanen, A., Patanen, T., Kuntien rakennuskannan kehitys- ja säästöpotentiaali, Valtioneuvoston selvitys- ja tutkimustoiminnan julkaisusarja [Development and savings potential of municipalities' building stocks, Government's publication series of research and study operations] 5/2018.

ASSESSMENT OF ENERGY EFFICIENCY INVESTMENTS

To improve energy efficiency and achieve a good indoor climate, a increasing amount of investments are required. In terms of new builds, the investments in energy efficiency is clear, but an increasing amount of significant energy efficiency investments should also be implemented at renovation construction sites.

Since investments related to energy efficiency are typically large and have a long-term effect, it is worth paying particular attention to the assessment of investments' profitability.

Established methods for assessing the profitability of investments include:

- 1) **Repayment period**, which refers to how long it takes for the investment to repay itself and thereafter become profitable. The method does not take a stand on the overall profitability of the investment, and it cannot be considered as a method that supports lifecycle thinking.
- 2) **Net current value** clarifies the overall value of the investment in current money. In this method the future income and outgoings are assessed and valued at a chosen interest rate.
- 3) **Internal interest rate** refers to the profit percentage of the investment, i.e. the interest achieved for the invested capital.

GENERAL INVESTMENT METHODS IN A NUT SHELL

Method	Repayment period	Investment's net current value	Internal interest rate
Key figure	Time, which is spent for the investment to have paid itself back as e.g. savings and/or additional income.	Calculates the investment's net current value in current monetary value (after the deduction of investment costs).	What is the interest that is produced by capital that has been invested (is it e.g. Greater than the interest rate of the required loan)?
Advantages	The graphicness of the end result, the calculation stage can be rather simple. Can be applied as e.g. a preliminary qualification method.	Considers the investment's overall profitability and residual value, supports life cycle thinking.	Perceives the investment's profitability in relation to funding options. Can be done easily on the basis of net current value calculation details.
To be considered	In its basic form, does not consider the time value of money or the overall profitability, is often based on rather few assumptions.	Applies an interest for interest calculation method, in which case small uncertainties in preliminary data cause major uncertainty in the end result.	Only indicates the relative profitability. When comparing investment options a euro-based profitability review must be carried out separately.

ENERGY EFFICIENCY INVESTMENTS AND RISKS

When assessing the profitability of energy efficiency investments, a number of future-related assumptions must be made. Typically, it is a case of the probability of costs and income taking place in the future and the development concerning the unit price. These can be relatively easy to be predicted for a period of a few years or in case of mortgageable agreements. The holding period of an investment may be decades, in which case the uncertainties related to the future grow significantly. In addition, the future is often assessed in calculations with the principle of interest for interest. In this case, the change of even one percent e.g. in the forecast of an increase in energy prices, can easily affect the conclusion of an investment's profitability. In the long term, many other things in addition to the price of energy becomes rather uncertain. Technology can develop rapidly. Changes of the regulation environment concerning environmental issues may change significantly, as can the taxes and fees related to an operating environment. These are factors that in their share cause a known phenomenon known as an energy paradox: although energy efficiency investments are considered to be important, exceptionally good profitability is required for their implementation.

TIMING OF ENERGY EFFICIENCY INVESTMENTS AND INVESTMENT PROGRAMMES

Energy efficiency investments are often significant in terms of their financial size. It may be a question of acquiring new building automation for a wide-scale building complex or the renewal of a building's exterior layer. Energy efficiency investments are also often related to a larger entity and they are not worth implementing separately. The majority of Finland's building stock has been built in the 1960s-1990s, and energy efficiency investments made to this group of building are the most cost-effective. Large renovation projects often provide the opportunity for the comprehensive improvement of energy efficiency. They may, however, not become topical until long after repairs would have been topical from an energy efficiency perspective.

Strategic property maintenance involves a wide-scale view of the property's needs for repairs and staging, on which basis a repair investment programme for an entire property portfolio may be prepared. Such programme may be prepared and approved each governmental period, and it may be part of e.g. a so-called governmental agreement. Repair investment programmes provide consistency and perseverance to decision-making and allow overall optimisation. Longer term investment programmes emphasise proactive property maintenance, so that sudden surprises and often expensive quick solutions are avoided.

FUNDING OF ENERGY EFFICIENCY INVESTMENTS

The funding of investments is an important part of investment analysis and investment decision-making. This is due to the fact, despite the time value of money not necessarily being considered in simple investment calculations. Investments can occasionally be funded directly with personal capital and a resulting alternative cost, e.g. At the amount of lost interest income, can be calculated for personal capital. Investments are often funded as a combination of personal and foreign capital, in such a way that the overall cost of funding can be minimised.

As the financial markets have become more diverse, new funding models are available for funding energy efficiency investments. Some municipalities have successfully utilised the ESCO operating model, in which the investment is funded with accumulated energy savings. "Green funding" offered by municipal funding is targeted funding for so-called green investments.

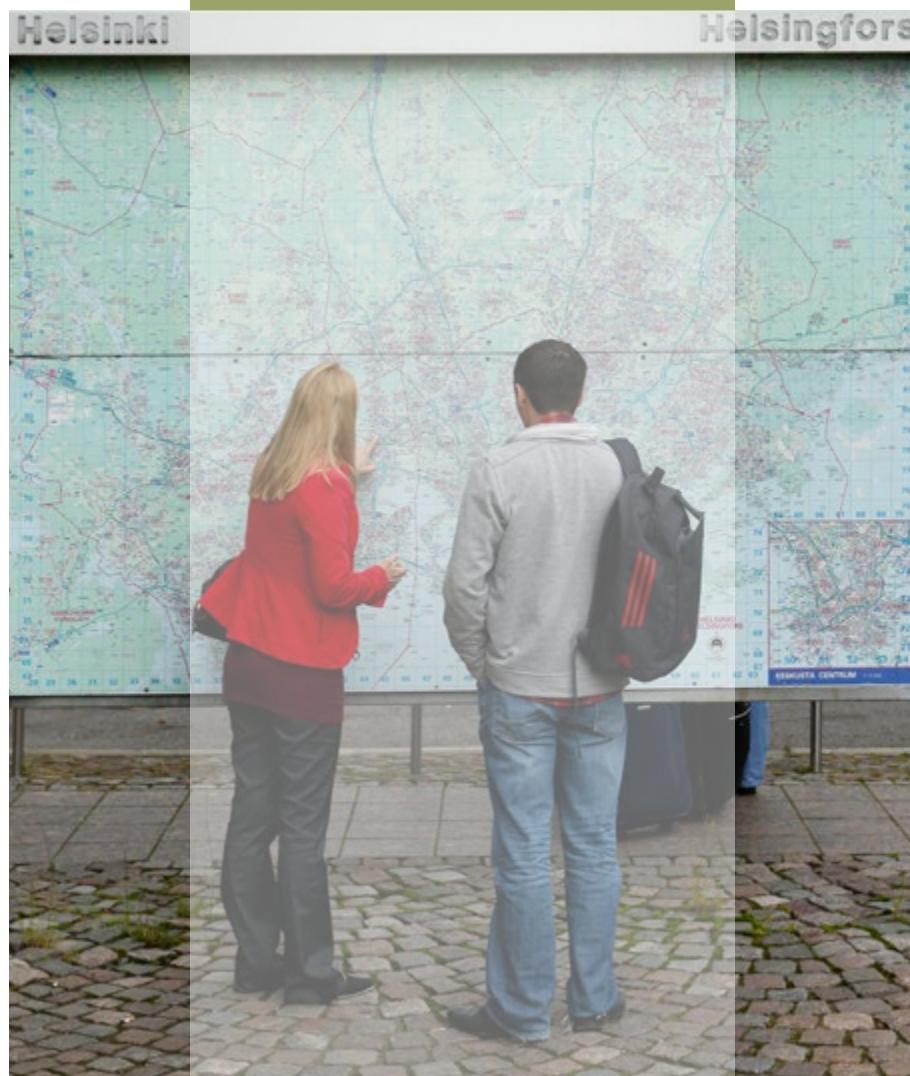
ENERGY SUPPORT

Energy support can be obtained for investment and survey projects, which promote the production or use of renewable energy, energy efficiency or the low carbon levels of an energy system.

Investment projects related to energy savings and the efficiency of energy consumption may be energy efficiency agreement system -related projects of general technology or demonstration projects of new technology.

In principle, support applications are processed by the Innovation Funding Centre Business Finland. If the acceptable costs of an investment project exceed 5 million euros or, in case of new technology, a million euros, the Ministry of Employment and the Economy shall decide on granting support.

Source: <https://www.businessfinland.fi/suomalaisille-asiakkaille/palvelut/rahoitus/pk-ja-midcap-yritys/energiatuki/>



ENERGY EFFICIENCY INVESTMENTS FROM THE PERSPECTIVE OF THE ACT ON PUBLIC PROCUREMENT AND CONCESSION CONTRACTS

A municipal procurer must apply the Act on Public Procurement and Concession Contracts (1397/2016) to procurements that exceed the national threshold values. In case of goods and services, the threshold value is 60 000 euros and in case of building projects 150 000 euros. Thus, a significant amount of the total value of energy efficiency investments is acquired according to the regulations of the Act on Public Procurement and Concession Contracts.

Successful tendering of energy efficiency procurements usually starts with the fact that a market dialogue has been organised for the procurement, i.e. Potential tenderers discuss with the client in good time before the procurement. A key part to the success of the entire procurement is, how procurement criteria have been set. The most significant individual question is whether the overall financial affordability is assessed on the basis of procurement costs or on the basis of lifecycle costs, and on the other hand, how much weighted value is placed on so-called quality criteria. If the decision is lifecycle costs in terms of costs, suitable criteria may be e.g. user costs, maintenance costs and costs during the recycling and disposal phase.

The most affordable in terms of lifecycle costs may not always be the most affordable in terms of its procurement cost. Thus, at the time of procurement, a large procurement cost must be invested, which is assumed to be repaid as discounted overall costs (lifecycle costs).

Setting quality criteria as part of the overall affordability is recommended despite the fact that their valuation often involves its own challenges. Such criteria may be, for example, the low carbon levels of a site or the environmental friendliness of necessary raw materials.

In 2017, the Ministry of the Environment published a guide on the procurement criteria of low carbon construction, which reviews the energy perspective as well as the carbon footprint of materials, as well as low carbon promoting innovations and in support of the procurement guide's green public construction. Even more effort must be placed on the preparation of a project, to ensure that low carbon construction is promoted.

Source: Kuittinen M., le Roux, Simon, Vihreä julkisen rakentamisen, Hankintaopas [Green public construction, Procurement guide], Ministry of the Environment 2017;
 Kuittinen M., le Roux, Simon, Vähähiilisen rakentamisen hankintakriteerit [Procurement criteria for low carbon construction], Ministry of the Environment 2017.

INTERACTION, ISSUES ARE SOLVED BY MEANS OF NEGOTIATIONS

The users of properties and municipal services are customers of the property strategy. Users' observations and notices on the condition and functionality of properties in addition to systematic measurements of property maintenance provide important information to the decision-making chain.

The results achieved solely by developing operational actions are not sufficient, instead operating models, which allow energy efficiency to be taken from strategy to everyday life, are needed to commit all the staff of a community. The actual long-term effectiveness that can be measured is not visible until energy efficiency is part of the process of daily management and the implementation of property maintenance work. Investment decisions are also often needed to achieve objectives.

ENERGY EFFICIENCY INVESTMENTS AND ARTIFICIAL INTELLIGENCE

Artificial intelligence is becoming part of energy efficiency solutions. Buildings, primarily their heating solutions, are becoming machine learning-based. In practice, this means that the heating of buildings is not based on pre-programmed adjustments and operating logics. Better results are achieved with solutions, in which the building self-monitors, and through trial and error, learns to make

the best possible solutions. The next development step is formed by operating logics that is based on artificial intelligence, in which energy consumption and indoor climate conditions can be entirely optimised.

The importance of artificial intelligence in energy efficiency work is not limited to the optimisation of buildings' operations, but artificial intelligence algorithms may also be beneficial in ownership-related decision-making, such as when planning energy efficiency investments. Artificial intelligence algorithms can be used to analyse e.g. the preliminary data of investments and probabilities related to the accuracy of investment decisions. For example, artificial neurological networks can be used to produce new kinds of analyses in support of decision-making. These may involve, for example,

- regional analyses indicating the need for service production
- classification and grouping of building stock
- modelling the energy consumption of individual buildings.

Instead of actual artificial intelligence, a wider significance may, at least in the next stage of development, refer to augmented intelligence, which refers to intelligence formed by the interaction of humans and machines. By applying artificial intelligence, new kinds of analyses are produced in support of decision-making. At the beginning of development, the role of a machine is therefore computational and assistive. The task of human intelligence is to provide significance and produce interpretation for the newly formed information.

WHAT MUST A DECISION-MAKER KNOW WHEN DECIDING ON INVESTMENTS

A municipality's long-term investment programme is built on the basis of service network surveys, an operating environment programme, the technical classification and portfolio grouping of buildings. An investment programme is prepared for at least ten, but for preferably up to twenty years and it is combined with the municipality's financial planning.

CHECKLIST CONCERNING ENERGY EFFICIENCY INVESTMENTS FOR MUNICIPAL DECISION-MAKERS

- Is the bigger picture of property management clear, such as the current state and objective of the municipal service network?
- Do long-term objectives of energy efficiency exist and are they sufficiently ambitious?
- Is the investment programme up-to-date and have the best subjects of investment been identified?
- Have the general and parallel funding opportunities of investments been clarified?
- Is the decision-making concerning investment decisions efficient and in accordance with schedules?
- Is monitoring up-to-date and is there readiness and willingness for repair procedures?



SOURCES

Funding of energy efficiency - background survey, Motiva 2018.

Korhonen, E., Niemi, J., Ekuri, R., Oksanen, R., Miettinen, H., Parviainen, J., Haapanen, A., Patanen, T., Kuntien rakennuskannan kehitys- ja säästöpotentiaali, Valtioneuvoston selvitys- ja tutkimustoiminnan julkaisusarja [Development and savings potential of municipalities' building stock, Publication series on governmental survey and research operations] 5/2018.

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LEGISLATION RELATED TO THE TOPIC

Energy Efficiency Act 1429/2014.

Procurement Act 1397/2016. Act on Public Procurement and Concession Contracts.

Amended Energy Efficiency Act 1338/2016.

Ministry of the Environment. 4/2013. The Ministry of the Environment's regulation on improving a building's energy efficiency in repair and change work.

Ministry of the Environment. 2/2017. The Ministry of the Environment's regulation on amending the regulation on improving a building's energy efficiency in repair and change work.

<https://wwf.fi/economise>

**AS FUNDED BY THE ECONOMISE PROJECT,
TRAINING ON THE FOLLOWING TOPICS IS AVAILABLE
TO MUNICIPAL DECISION MAKERS AND OFFICIALS:**

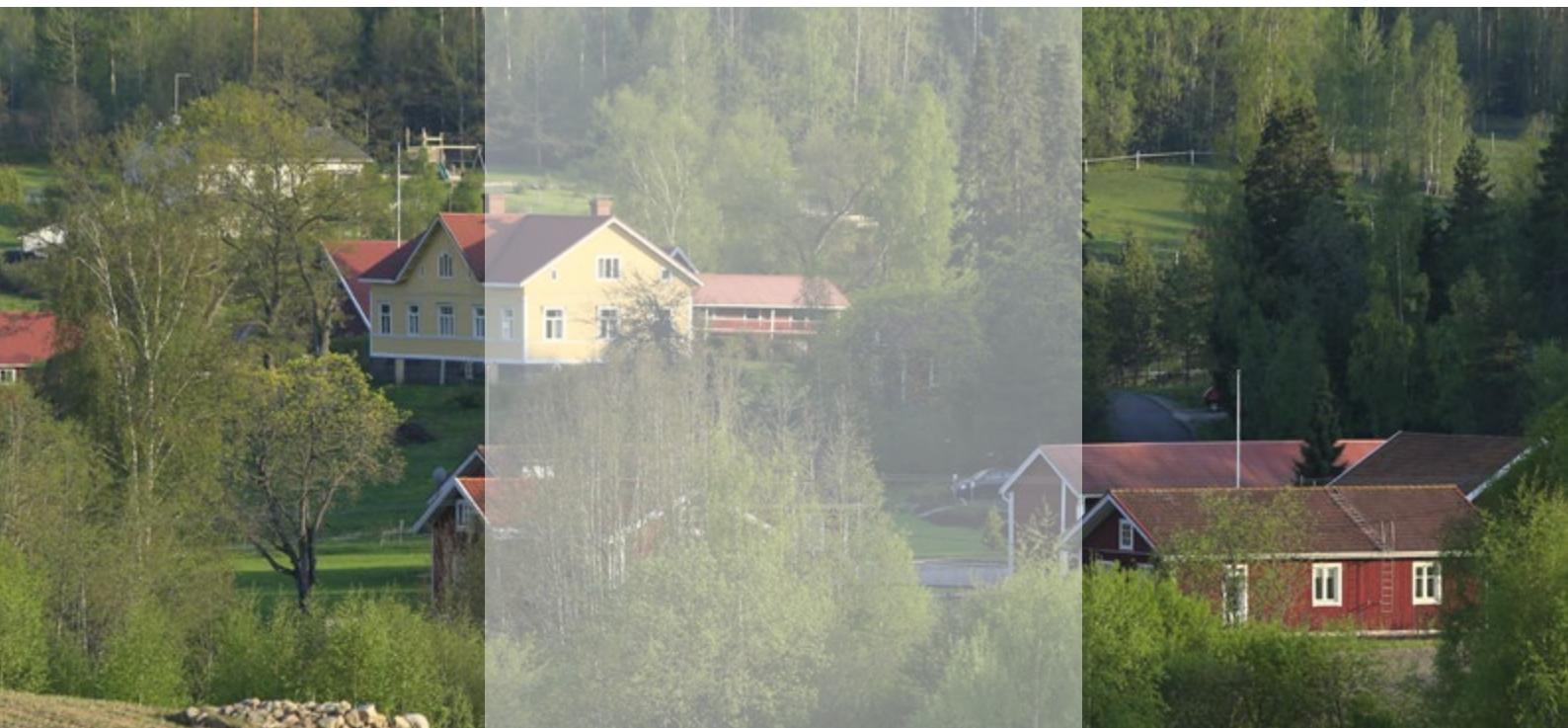
- Life cycle thinking as part of energy efficient property management
 - Energy efficiency and indoor air quality
- Energy efficiency and property management
- Assessment of energy efficiency investments
 - Energy efficiency and property value
 - Artifical intelligence and energy efficiency

MORE INFORMATION:
sykli.fi/hankkeet/life-economise-hanke/

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