MuniFin green bonds impact report 2017

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Green finance is gaining speed

Municipality Finance's green finance developed remarkably in 2017. During the year, 25 projects were approved and added to the green project portfolio. The total value of the green project portfolio reached EUR 1.02 billion.

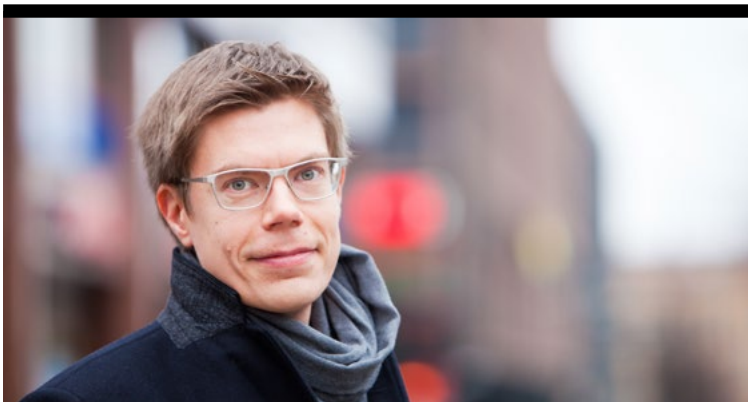
During 2017, we deepened our cooperation with the Ministry of the Environment and the Finnish Environment Institute, among other institutions and organisations. We also participated in several events in Finland and abroad and organised our first green finance seminar together with the Finnish Environment Institute in November.

In addition, we participated in a Nordic cooperation with the aim of increasing transparency and publishing recommendations for green bonds impact reporting. The *Position Paper on Green Bonds Impact Reporting* was published at the OECD Green Investment Financing Forum in Paris in October. The calculations presented in this report are based on the recommendations in the new Nordic reporting guidelines.

The estimated direct annual CO_2 emissions avoided for projects approved in 2017 totals 19,422 tons of CO_2. The corresponding estimated total annual energy savings of the projects amount to approximately 11,900 MWh. Additionally, projects financed by MuniFin enable the annual production of around 19,000 MWh of renewable energy. The corresponding figures for 2016 have also been updated due to the changes made to the calculation principles. The methodologies used for calculations can be found on page 28.

Besides the quantitative environmental effects discussed in this report, green finance projects also have other wide-ranging effects. For example, there are various social and economic effects that are beneficial on individual and regional levels. Green finance projects support regional vitality and attractiveness, improve well-being and promote the introduction of new, even more environmentally friendly technologies.

In September 2017, we issued our second green bond. The 10-year, EUR 500 million bond exceeded all of our expectations: it was oversubscribed by almost six times within the first hour of issue. The bond was by far the most oversubscribed benchmark transaction in the history of MuniFin in terms of the size and in absolute terms. A record number of investors, 100 in total, participated in the transaction and approximately 30 of them were new investors for MuniFin.



Responsibility has become a key value creation component for companies and is here to stay. During the past few years we've learned that investors are increasingly interested in what their money is actually used for and the impact that can be achieved through their investments. This applies to green projects in particular, however other forms of responsible investing are also growing rapidly such as social bonds.

Work against climate change has reached high levels of momentum due to innovative thinking in many cities and municipalities in Finland. Our goal and responsibility is to encourage our customers to mitigate the effects of climate change in the best way possible when planning new investments. This is the only way to increase national well-being in the long-run.

Antti Kontio
Head of Corporate Responsibility
Municipality Finance

Summary: MuniFin green finance and green bonds in 2017

Green bonds issued in 2017

2

Projects approved

25

CO_2 emissions avoided

19,400

tCO_2/year

New green finance

598

EUR million

Green projects total in 31 December, 2017

1.02

EUR billion

Renewable energy production

18,965

MWh/year

Recent developments in MuniFin green bonds

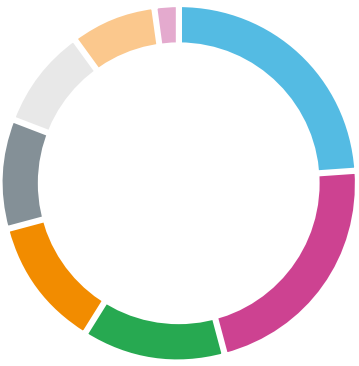
The second green bond issued by MuniFin was the most oversubscribed benchmark in the company's history.

At the end of September 2017, MuniFin issued its second-ever green bond. The markets went wild due to the 10-year, EUR 500 million bond issue, which was oversubscribed by almost six times in just one hour. The size of the portfolio grew to a record-high EUR 2.8 billion. A fixed coupon of 0.75% is paid to investors annually, and the bond was priced extremely tight, 7.0 basis points below the mid-swaps.

– MuniFin's reputation among investors is excellent, and our green framework received a very warm welcome in investor meetings even before the issuance. This transaction shows that there is a lot of demand for responsible investments both in Finland and globally, says Joakim Holmström, Executive Vice President, Capital Markets at MuniFin.

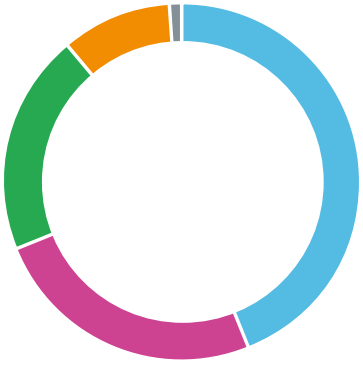
According to a survey carried out by the Crédit Agricole CIB, MuniFin's euro-denominated green bond was the most oversubscribed SSA issue in the history of the green bonds.

Geographical location



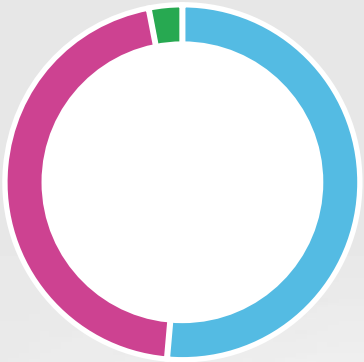
- Germany 24%
- Nordic countries 22%
- France 13%
- Asia 12%
- Benelux countries 10%
- Other European countries 9%
- United Kingdom 8%
- Switzerland 2%

Investor base



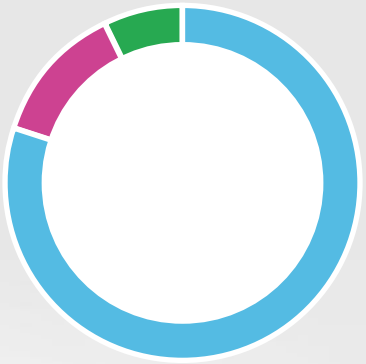
- Bank Treasuries 44%
- Pension funds/Insurance 25%
- Central banks/Official institutions 20%
- Asset managers 10%
- Other 1%

Outstanding green bonds



EUR 500m matures in 2027 51%
USD 500m matures in 2021 45%
AUD 50m matures in 2027 3%

Investor base



Europe 80%
North America 13%
Asia 7%

MuniFin currently has three green bonds outstanding. At the end of 2017, the amount of green bonds totals EUR 978.1 million and the average maturity is 7.4 years. The goal, in accordance with the company's key themes for corporate social responsibility is to issue one green bond per year and MuniFin has succeeded in this over the past two years.

Green bonds enable MuniFin to provide international and domestic investors with a responsible product, which they can use to support innovative thinking in the local government sector and drive Finland towards long-term low carbon goals. Furthermore, green bonds enable MuniFin to attract new SRI investors.

Selection process and the role of the Green Evaluation Team

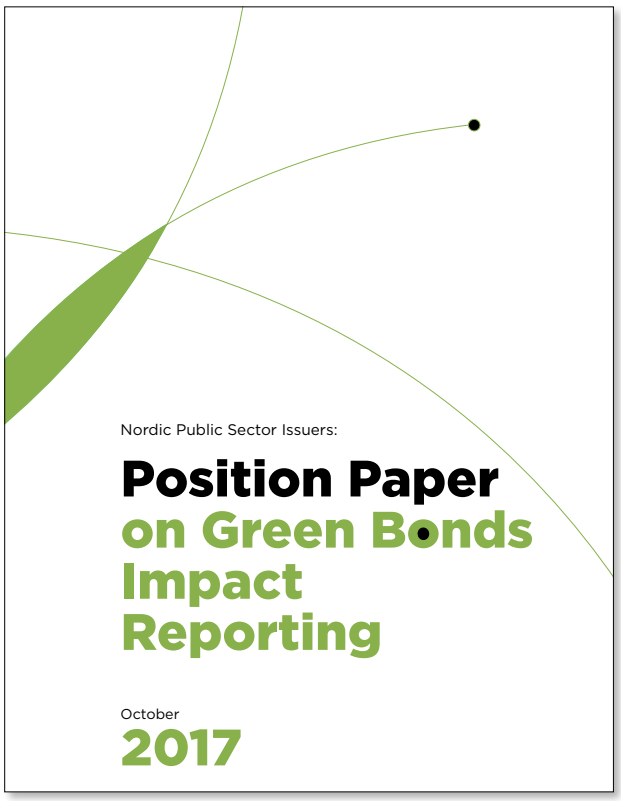
In 2017, there were three members in the Green Evaluation Team:

- Mrs. Saara Vauramo (chair), Environmental Director, City of Lahti
- Mr. Kalevi Luoma (deputy chair), Energy Engineer, Association of Finnish Local and Regional Authorities
- Mr. Jyri Seppälä (member), Professor, Director of the Centre for Consumption and Production, Finnish Environment Institute

MuniFin's eligible projects are selected based on the Green Framework and finally approved by an external Green Evaluation Team. Every project is assessed independently and only approved if long-term positive environmental effects can be achieved. To attract customers to make more environmentally friendly investments, MuniFin has decided to award a margin discount for eligible projects. The discount is based on the project's estimated environmental impact. Each project will be evaluated and graded by the Green Evaluation Team between 0 and 10 "green points". Dark green projects are usually graded between 7–10 points, medium green between 4–6 points and light green 1–3 points. The final margin discount for the customer will be based on these points.

Nordic issuers published joint recommendations for green bonds impact reporting

MuniFin is one of ten Nordic issuers who jointly published a guide for green bonds impact reporting. The *Position Paper on Green Bonds Impact Reporting* was published in 2017. The recommendations were drawn up by Nordic green bond issuers specialising in the public sector. MuniFin was the only Finnish issuer in the group. Other participants included two of MuniFin's counterparts – Kommunalbanken in Norway and Kommuninvest in Sweden as well as several Swedish county councils and municipalities which have issued green bonds.



A harmonised approach to impact reporting will make the work of both issuers and investors easier.

The aim of the guide is to assist new customers planning a new investment, lower new issuers' thresholds for entering into green bond markets and provide international investors with a tool for evaluating green finance portfolios.

– Green bond issuers are committed to report the impacts of their green assets. A harmonised approach to impact reporting will make the work of both issuers and investors easier, says Antti Kontio, who is in leading the corporate responsibility activities at MuniFin.

Green finance portfolios from Nordic green bond issuers vary by the size of assets and the projects are divided into several categories. Other guidelines on green bonds impact reporting already exist on the markets, however, due to the special characteristics of different markets, the Nordic guidelines had to be tailored to make them more descriptive and meaningful.

The Nordic guidelines and recommendations are based on the Green Bond Principles (GBP) and the work done by multilateral development banks. However, these have been complemented with an interpretation of impact indicators for projects focusing on categories such as public transportation, sustainable buildings and water purification and wastewater management.

The paper has benefited from input from CICERO Center for International Climate Research, the Nordic Investment Bank, SEB, and Crédit Agricole CIB as well as several investors throughout the process.

Year 2017 CASE

TAMPERE TRAMWAY

Tampereen Raitiotie Oy is acting as the client in the construction of tram lines for the most congested section of the public transport system in the Tampere City Region. Rail traffic is the most effective way of transferring traffic from private cars to public transport. The tram lines are part of creating an infrastructure in the Tampere region that will reduce traffic emissions in the long run, as well as centralising and densifying housing construction. The Tampere Tramway project is partly financed by MuniFin's green finance.

Impact evaluation for 2017

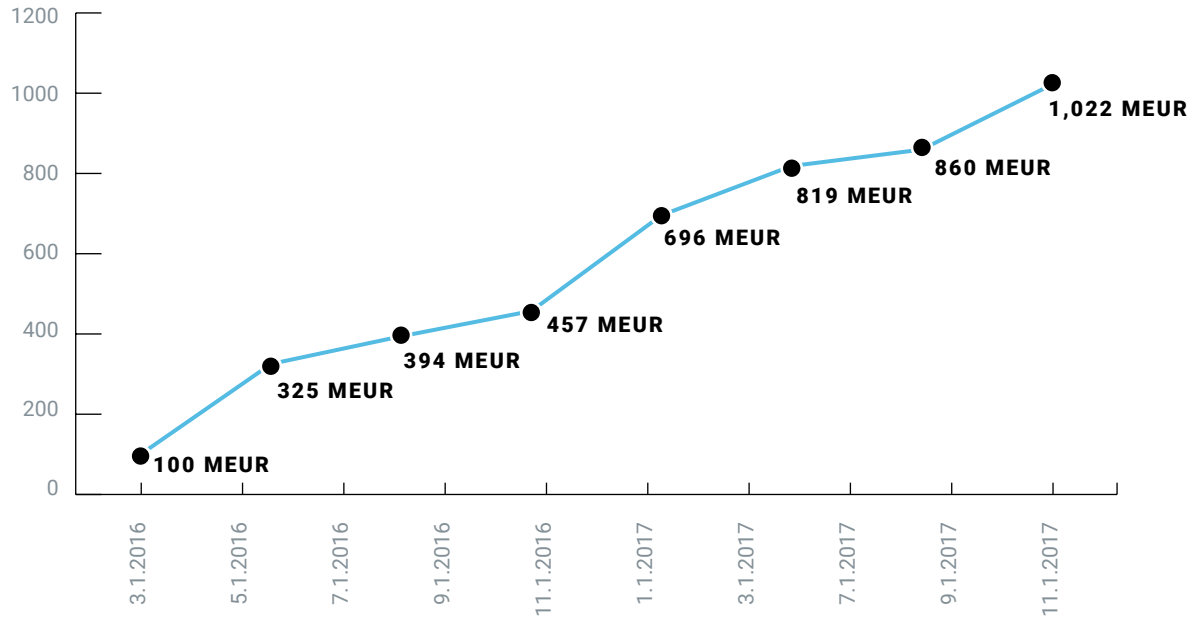
MuniFin's green finance has many positive effects on the environment, economy and society. Both the estimated direct positive environmental impact and other, more wide-ranging benefits to society are discussed in this report. Projects financed by MuniFin are characterised by cooperation between municipalities and various other operators. Such collaboration generates new types of partnerships and practices, as well as promoting the creation of new sustainable business. Additionally, a margin discount is granted for eligible green projects, which is unusual. Due to the discount, local governments and other operators have the possibility to allocate the benefit to other development projects, and in the best case scenario to other projects promoting a climate resilient society and sustainable practices.

Projects financed by MuniFin promote the transition to low-carbon and climate-resilient growth. Project categories are grouped into seven categories in accordance with MuniFin's green bonds framework.

Categories for green finance:

- Sustainable buildings
- Energy efficiency
- Renewable energy
- Public transportation
- Water and wastewater management
- Waste management
- Environmental management

Development in the green portfolio



In 2017, 25 new projects were approved to the green project portfolio, with a combined value of almost EUR 600 million. At the end of 2017, the total amount of the green portfolio stood at EUR 1.02 billion.

In the end of 2017, EUR 840.0 million has been disbursed from the committed green portfolio and the remaining EUR 182.0 has been invested according to MuniFin's short-term investment principles.

The average maturity of the green finance portfolio was 27.3 years at the end of 2017. The projects added to the portfolio in 2017 have an average maturity of 28.3 years.

Projects approved and financed by MuniFin, which totalled EUR 597.9 million in 2017, were spread evenly between 18 localities in Finland.

MuniFin financed a total of 25 eligible green projects in 2017. In 2017, the two largest project categories were public transportation and sustainable buildings. Public transportation projects enable the development of a city infrastructure based on sustainable and environmentally friendly mobility. In 2017, MuniFin financed two nationally significant public transportation projects: the Western Metro Extension between Ruoholahti and Matinkylä in the Helsinki Capital Region and the Tampere Tramway project. Sustainable building accounted for the largest project category with 16 green projects in 2017. Sustainable building projects focus on the construction of energy-efficient and environmentally friendly residential buildings, as well as public buildings (including schools, day care centres and other public buildings). Combining innovation, new technologies, learning and networks between environmental industries and society in general, sustainable building projects have far reaching and comprehensive impacts on the environment, economy and life within the Finnish municipalities.

AMENDMENTS TO 2016 IMPACT EVALUATION

The results of 2016 and 2017 are not fully comparable due to changes in calculation principles and emission factors as a result of the adoption of the Position paper on green bonds impact reporting. The 2016 impact report on the the West Metro extension covered the entire project, since the construction work for the first phase of the project was still ongoing and MuniFin's contribution was not yet known. Based on the calculations of the Environmental Impact Assessment (EIA), the amount of annual CO_2 emissions avoided during the first phase of the West Metro extension was reported to be 6,803 tCO_2. Taking into account MuniFin's contribution for phase 1 (18.5%), the updated figure of avoided tCO_2 for 2016 is 1,260 tCO_2.

The amended amount of annual CO_2 emissions avoided in 2016 is 3,145.35 tCO_2. It should also be noted that the emission factors used to calculate the CO_2 emissions avoided in 2016 are not comparable to the corresponding figures for 2017.

MUNIFIN'S APPROACH TO IMPACT EVALUATION

The green bond impact reporting of MuniFin is based on the guidance provided in the *Position Paper on Green Bond Impact Reporting*, which was jointly drawn up by a group of Nordic public sector issuers.

MuniFin's impact reporting is carried out in accordance with the following principles:

- The calculation of the impact of projects financed by MuniFin is based on MuniFin's contribution expressed as a portion of the total investment in the project
- Reporting is based on "ex-ante" impact estimates at the time of project appraisal
- The impact evaluation covers both quantitative and qualitative aspects
- We strive to continuously improve our reporting process and practices, and would welcome any comments and development proposals related to them.

The key impact indicators included in the calculation are presented in the table by project category. Further information on the calculation principles and assumptions applied is provided by project category under "Calculation principles", from page 28.

Impact indicators by project category

Project category	Significant direct impact
Sustainable buildings	• Annual energy savings (MWh) • Annual CO_2 emissions avoided (tCO_2)
Energy efficiency	• Annual energy savings (MWh) • Annual CO_2 emissions avoided (tCO_2)
Renewable energy	• Annual CO_2 emissions avoided (tCO_2) • Annual production of renewable energy (MWh) • Production capacity for renewable energy (MW)
Sustainable public transportation	• Annual CO_2 emissions avoided (tCO_2)
Water purification and wastewater treatment	• Annual amount of treated wastewater (l/m^3)

* tCO_2 means tonnes of CO_2

Year 2017 CASE

WEST METRO

The first part of the West Metro extension opened for passenger traffic in November 2017. The 14-kilometre long metro line runs from Ruoholahti in Helsinki to Matinkylä in Espoo and has eight new stations. An estimated 100,000 passengers use the Ruoholahti–Matinkylä metro line on a daily basis, which represents a major contribution to the reduction of traffic emissions. The new metro line is also contributing to the centralisation and densification of housing construction. The West Metro is partly financed with MuniFin's green finance.

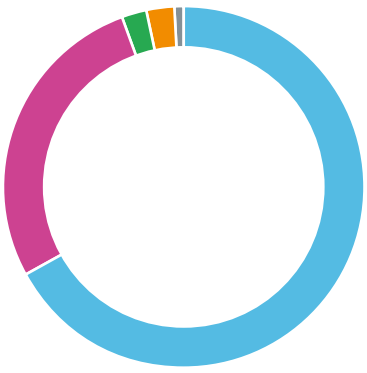
Summary of MuniFin's green finance projects

The average maturity of the green finance portfolio was 27.3 years at the end of 2017. The projects added to the portfolio in 2017 have an average maturity of 28.3 years.

Projects approved and financed by MuniFin, which totalled EUR 597.9 million in 2017, were spread evenly between 18 localities in Finland. At the end of 2017, the total amount of the green portfolio stood at EUR 1.02 billion.

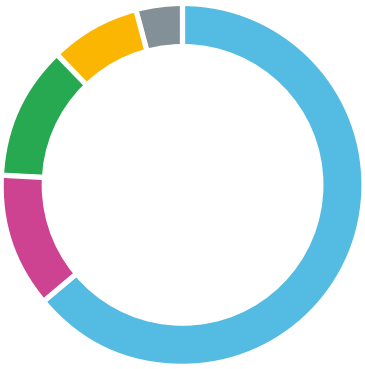
MuniFin financed a total of 25 eligible green projects in 2017. In 2017, the two largest project categories were public transportation (66.9%) and sustainable buildings (27.4%). Public transportation projects enable the development of a city infrastructure based on sustainable and environmentally friendly mobility. In 2017, MuniFin financed two nationally significant public transportation projects: the Western Metro Extension between Ruoholahti and Matinkylä in the Helsinki Capital Region and the Tampere Tramway project. Sustainable building accounted for the largest project category with 16 green projects in 2017.

Green finance projects by category (597,8 MEUR)



- Public transportation 66.91%
- Sustainable buildings 27.44%
- Renewable energy 2.49 %
- Water and wastewater management 2.51%
- Energy efficiency 0.64%

Green finance projects by category (25 projects)



- Sustainable buildings 16
- Energy efficiency 3
- Public transportation 3
- Renewable energy 2
- Water and wastewater management 1

PROJECTS APPROVED IN 2017

Project	Customer	Municipality	Project category	Loan amount, €	MuniFin's share of finance, %
Construction of apartment building and townhouse	Helsingin Asumisoikeus Oy (HASO)	Helsinki	Sustainable buildings	16,475,300.00 €	100 %
Construction of apartment buildings	Helsingin kaupungin asunnot OY (Heka)	Helsinki	Sustainable buildings	9,639,000.00 €	100 %
Construction of apartment building, townhouse and maintainance building	Helsingin kaupungin asunnot OY (Heka)	Helsinki	Sustainable buildings	14,212,000.00 €	100 %
Environmental school of Mahnala	Hämeenkyrön kunta	Hämeenkyrö	Sustainable buildings	7,000,000.00 €	100 %
Fire station of Kalajoki	Kalajoen kaupunki	Kalajoki	Sustainable buildings	3,000,000.00 €	100 %
Building for elderly and renovation of the central commercial kitchen	Pielaveden kunta	Pielavesi	Sustainable buildings	5,063,400.00 €	100 %
Community center of Hirvensalo	Turun kaupunki	Turku	Sustainable buildings	20,000,000.00 €	100 %
Construction of apartment building	Kiinteistö Oy Oulun Tarve	Oulu	Sustainable buildings	5,888,000.00 €	100 %
Construction of residential building	Kiinteistö-KYS Oy	Kuopio	Sustainable buildings	9,706,365.00 €	100 %
Construction of three residential buildings	Lahden Asunnot Oy	Lahti	Sustainable buildings	12,754,770.00 €	100 %
Building for elderly	Lahden Asunnot Oy	Lahti	Sustainable buildings	8,327,937.00 €	100 %
Eco-school of Laukaa	Laukaan kunta	Laukaa	Sustainable buildings	5,000,000.00 €	100 %
School of Leppävirta	Leppävirran kunta	Leppävirta	Sustainable buildings	10,000,000.00 €	100 %
School of Lievestuore	Laukaan kunta	Laukaa	Sustainable buildings	15,000,000.00 €	100 %
School of Linnukka	Limingan kunta	Liminka	Sustainable buildings	5,000,000.00 €	100 %
School campus of Parkano	Parkanon kaupunki	Parkano	Sustainable buildings	17,000,000.00 €	100 %
Renewing street lighting	Kotkan kaupunki	Kotka	Energy efficiency	305,000.00 €	100 %
Improving energy efficiency of ten schools	Tampereen kaupunki	Tampere	Energy efficiency	2,000,000.00 €	100 %
Energy saving project, city of Vantaa	Vantaan kaupunki	Vantaa	Energy efficiency	1,550,000.00 €	100 %
Self-suffiency in energy, project of Lempäälä	Lempäälän Energia Oy	Lempäälä	Renewable energy	9,700,000.00 €	100 %
Heating plant	Lempäälän Energia Oy	Lempäälä	Renewable energy	5,200,000.00 €	100 %
Subway, extending subway of Helsinki to city of Espoo, Länsimetro project	Länsimetro Oy	Espoo/ Helsinki	Sustainable public transportation	245,000,000.00 €	21 % [1)]
Tramline, city of Tampere	Tampereen Raitiotie Oy	Tampere	Sustainable public transportation	155,000,000.00 €	50 % [2)]
Electric car (MuniFin's electric car campaign)	Nurmeksen kaupunki	Nurmes	Sustainable public transportation	34,700.00 €	100 %
Purification plant center, project of Kalajokilaakso	Vesikolmio Oy	Kalajoki	Water and waste water management	15,000,000.00 €	100 %

1) The overall expenditure of West Metro: https://www.lansimetro.fi/tietoa-hankkeesta/kustannukset

2) The overall expenditure of the Tampere Tramway: MuniFin has indicated its financing share of the investment is 50%

TOTAL

EUR 597 856 472

Results for 2017

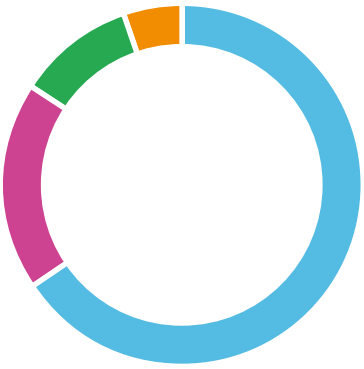
The consultancy company Deloitte analysed and calculated the environmental impact that was achieved through MuniFin's green finance in 2017. According to the analysis, the total estimated direct annual impact of CO2 emissions avoidance in projects aiming to mitigate climate change (energy efficiency, sustainable buildings, and public transportation) is approximately 19,420 tonnes of CO2. On an annual basis, the projects generate approximately 11,890 MWh worth of energy savings. Additionally, it is estimated that projects financed by MuniFin will enable the annual production of around 18,960 MWh of renewable energy.

Besides the quantitative environmental benefits, the projects for which MuniFin has granted green finance also have other wide-ranging positive effects. In addition to environmental benefits, the projects' key characteristics include various social and economic effects that are beneficial on an individual level as well as locally and regionally. Through the eligible projects, MuniFin has the opportunity to engage in activities such as supporting regional vitality and attractiveness, enabling projects aiming to improve people's wellbeing, and promoting the introduction of new, even more environmentally friendly technologies.

Examples of the more wide-ranging effects of projects financed by MuniFin, by project category:

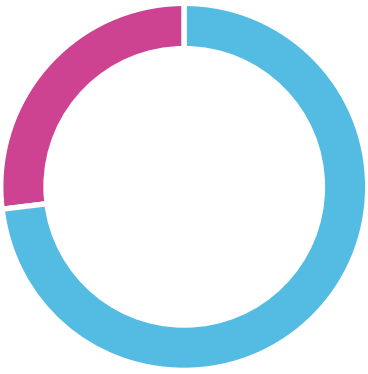
All categories	• Regional vitality and attractiveness • Support for finding employment • Innovativeness, new environmental technologies and piloting • Wide-ranging cooperation with stakeholders
Sustainable buildings	• Strengthening the sense of community • Pleasant living and green city communities • Support for early education and teaching • Flexible use of premises and taking account of various population groups • Security and healthy premises
Energy efficiency	• Piloting and reference value of new technologies • Financial savings for local governments • Better indoor air quality in public buildings
Renewable energy	• Piloting new environmental technologies and making their deployment possible • Impact of better air quality on human health • Regional competitiveness
Public transportation	• Pleasant living • Accessibility of services and fluency of everyday life • Densifying the city structure • Reduction of noise pollution
Water purification and wastewater treatment	• Recovery of bioenergy for energy production use • Improving water quality

Annual avoided CO_2 emissions (tCO_2)



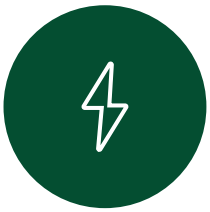
Renewable energy 12 734
Public transportation 3 666
Energy efficiency 2 007
Sustainable buildings 1 016

Energy savings by project category (MWh)



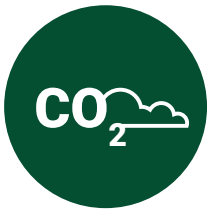
Energy efficiency 8 700
Sustainable buildings 3 193

Sustainable buildings



1,015.7

ANNUAL ENERGY SAVINGS (MWh)



3,192.7

ANNUAL CO_2 EMISSIONS AVOIDED (tCO_2)

16

NUMBER OF PROJECTS

In 2017, MuniFin financed 16 sustainable building projects in 12 localities in Finland. The projects' targets included seven school buildings, one fire station and a nursing home, as well as seven new blocks of flats and terraced houses. Since a single residential building project can comprise several blocks of flats and terraced houses, the actual total amount of new residential buildings was 12.

The ultimate goal of sustainable building projects financed by MuniFin is to make the buildings as energy efficient as possible. They take advantage of factors such as renewable energy use, energy process efficiency, and the use of intelligent control systems in order to achieve significant energy savings compared to the minimum requirements of energy efficiency legislation. All buildings constructed under the sustainable building projects category are in energy class B. Furthermore, two blocks of flats have solar panels for the production of renewable energy to offset the energy use of technical building systems.

Compared to the minimum energy efficiency of new constructions, the estimated annual total amount of energy savings achieved through the sustainable building projects is 3,192.7 MWh. As a result of the energy savings, an estimated 1,015.7 tons of CO_2 emissions are avoided each year.

THE PROJECTS HAVE BROADER SOCIAL AND ECONOMIC EFFECTS IN ADDITION TO THE CALCULATED POSITIVE ENVIRONMENTAL IMPACT:

- Many school buildings are designed from start to finish to enable the most flexible and versatile use of the premises in addition to promoting the well-being of those who use the buildings. In addition to offering actual teaching facilities, such buildings serve a broader range of population groups by also housing library services, youth centres and sports facilities capable of being used during evenings and weekends.
- MuniFin offers financing for public infrastructure projects (which cover schools, day care centres, fire stations and nursing homes) that play an important role in attracting working-age people to municipalities. High quality public buildings can thus have an indirect effect on the attractiveness and economic situation of municipalities.
- Sustainable building projects can act as important piloting sites for promoting sustainable construction (such as wood construction, outdoor and green spaces and intelligent systems).

Sustainable building projects are often implemented based on the public-private partnership (PPP) model. Using this model to implement sustainable building projects enhances the sustainability performance of the buildings over their life-cycle. PPP is a long-term arrangement in which the public sector acts as the project customer and owner, while a private sector operator acts as a contractor for the building project.

In a PPP project, the contractor is responsible for the design and construction of the building, as well as all maintenance and repairs, typically for 20 to 25 years. The contractor bears the financial risk associated with meeting the agreed quality standards and energy efficiency levels of the building. Higher energy efficiency targets are therefore likely to be met in PPP projects.

In 2017, MuniFin financed energy efficient school investments in several Finnish municipalities:

HIRVENSALO COMMUNITY CENTRE

Once completed, the multipurpose centre to be constructed in the Syvälahti district of Turku will have space for around 800 school children and 140 day care children. The centre will also house a library, youth services, school health services and a child welfare clinic. The goal is to build a safe and healthy learning and education environment in Syvälahti that is versatile, modifiable and suitable for sharing. The library aims to do its part to support the creation of a sense of community and act as an experiential meeting place for all types of operators in the region. The building is scheduled for completion in spring 2018.

LAUKAA ECO-SCHOOL

The goal of the eco-school concept implemented in Laukaa is to develop a model for an innovative village school that is based on the circular economy and local services. The model combines a healthy and durable building, sustainably produced energy management (local energy), local food and local transportation, as well as premises required for pioneering pedagogical activities. The concept promotes entrepreneurship in the area and enhances the sense of community, as well as boosting the local economy. The intention of the eco-school concept is to maximise the use of wood as a building material due to its ecological qualities, durability and positive impact on indoor air quality. The school is designed for just over 100 pupils.

PARKANO SCHOOL CAMPUS

The project for creating a new campus area in Parkano focuses on building healthy and functional premises that promote the well-being of its users. The new approaches used on the campus include semi-open learning environments which are a combination of traditional, closed classrooms and open spaces that can be divided into sections with movable furniture and curtains. The new types of learning facilities promote the achievement of the new curriculum's objectives. A sports facility with seating for 200 spectators will also be constructed on the campus. The inclusion of the sports facility will turn the school campus into a multipurpose centre that will also be used in the evenings and on the weekends. The two-storey campus building will have premises for providing primary, lower secondary and upper secondary education for a total of around 700 pupils. The plan is have the new premises ready for use by August 2019.

MAHNALA ENVIRONMENTAL SCHOOL

The goal for the Mahnala Environmental School located in the municipality of Hämeenkyrö is to create a building that is energy efficient and cost-effective throughout its life-cycle. The principles of sustainable development and the environmental education perspective have been taken into account throughout the design process. The idea is to use the most ecological building techniques and materials available. The construction of the Mahnala Environmental School serves as an example of the use of eco-efficient solutions in the construction of public buildings, in terms of their material and energy efficiency. In addition, solar panels are utilised in the generation of electricity for the building. There will be approximately 100 m² of solar panels, which will generate some 16,000 kWh of energy per year.

Year 2017 CASE

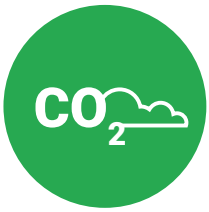
LAHDEN TALOT

To ensure energy-efficiency, Lahden Talot designs zero-energy rental buildings by taking account of the positioning of a building on a plot, the use of passive solar energy, building air tightness, the efficiency of ventilation equipment, the energy consumption of building technology, renewable energy, and building physics simulation. The company's first three zero-energy rental buildings were financed with MuniFin's green finance.

Energy efficiency

8,699.5

ANNUAL ENERGY SAVINGS (MWh)



2,006.5

ANNUAL CO_2 EMISSIONS AVOIDED (tCO_2)

3

NUMBER OF PROJECTS

In 2017, MuniFin financed three projects aimed at improving energy efficiency, located in Kotka, Tampere and Vantaa. Improving the energy efficiency of buildings is a cost-effective way of reducing CO_2 emissions. A total of around EUR 3.8 million in financing was allocated to the projects by MuniFin and the estimated annual amount of energy savings to be achieved is 8,699.5 MWh. This equals a reduction of more than 2,000 tCO_2.

In addition to the calculated positive environmental impact, the projects have broader social and economic effects:

- Energy efficiency projects offer municipalities an effective way of making cost savings, enabling them to use the saved money for other purposes and to boost their economy.
- The projects enable the piloting of new technologies within the Finnish local government sector while serving as a reference for the companies that develop the technologies. This plays a key role in, for example, the scalability and export potential of the solution.
- Another goal for the projects is to improve the indoor air quality of buildings. Indoor air quality plays a key role from the perspective of users of the buildings (such as schools, sports facilities, libraries and day care centres). Solutions that work can be used to indirectly improve the well-being of many people.

The City of Kotka will replace the current streetlight system with a new LED system, one area at a time. LEDs have many advantages over incandescent light sources, including lower energy consumption, a longer lifetime, improved physical robustness, smaller size, and faster switching. Several demonstrations have shown that reduced maintenance costs due to their extended lifetime, rather than just energy savings, is the primary factor in determining the payback period for an LED product.

In Tampere, 10 school buildings will participate in an energy savings project based on the ESCO concept. The ESCO (Energy Service Company) concept means the service provider takes full responsibility for the implementation of an energy savings project including reducing the energy costs of a building and maintenance to ensure energy savings during the agreement period. The actions are also implemented so as to maintain or improve the perceived indoor air quality. The project's key goals are to improve the total energy economy of the buildings, maintain and raise their indoor air quality, minimise their carbon footprint and environmental loading, as well as increase the buildings' energy efficiency and level of technology through the improvements made.

The City of Vantaa is using a similar ESCO concept. The purpose of the project is to improve the energy economy and technical functionality of buildings. The measures are being implemented in order to improve indoor air quality without compromising energy efficiency.

Renewable energy

12,733.6
ANNUAL CO_2 EMISSIONS AVOIDED (tCO_2)

18,064.0
ANNUAL PRODUCTION OF RENEWABLE ENERGY (MWh)

8.1
PRODUCTION CAPACITY FOR RENEWABLE ENERGY (MW)

2
NUMBER OF PROJECTS

In 2017, MuniFin financed two renewable energy projects, which were both located in Lempäälä in the Pirkanmaa Region. A new type of energy self-sufficient industrial zone is being built in the Marjamäki district of Lempäälä, as part of the "Energy Self-sufficient Lempäälä" project. The project's goal is to increase the use of renewable energy. The other project located in Lempäälä and financed by MuniFin involves development work aimed at the introduction of a new type of fuel storage and unloading concept for combined heat and power (CHP) plants. It is estimated that, on an annual basis, these two projects will produce roughly 18,000 MWh of renewable energy, and their estimated annual amount of CO_2 emissions avoided will be 12,733.6 tCO_2.

In addition to the calculated positive environmental impact, the projects have broader social and economic effects:

- Diversified energy production has a positive impact on regional competitiveness and on the local employment. It also enables the development of a new business model, thereby promoting the emergence of new types of partnerships in energy production.
- Renewable energy is emission-free during the production phase, and the reduced use of fossil fuels and resulting lower levels of air pollution have an impact on the health of local residents, improving the environment and thereby impacting on public sector health care costs.
- The price of solar power has dropped rapidly in recent years. At best, the price was lower than the market price, providing major savings to operators who use solar power.
- Energy can be produced closer to its place of use, thereby reducing the need for transportation as well as distribution and transmission losses – this has both environmental and economic effects on society.

By financing renewable energy projects, MuniFin is doing its part to promote Finland's long-term goal of becoming a carbon-neutral society. Efforts are being made to increase the use of renewable energy to meet the targets set in Finland's national energy and climate strategy and the Government Programme. In accordance with the Government Programme, the national energy and climate strategy was updated in 2016. The strategy outlines the concrete actions and targets that Finland must implement and meet in order to achieve the energy and climate targets of the current Government Programme and the EU target set for 2030. Finland's targets for renewable energy use are 50% of final consumption and a 55% energy self-sufficiency rate. Concrete actions announced by the Government will also end the use of oil for heating its office premises by 2025, and the Government is urging local governments and other public operators to do the same.

In the "Energy Self-sufficient Lempäälä" project, the energy system to be constructed in the Marjamäki industrial zone includes a 4 MW solar panel field, 116 kW fuel cells, 8 MW gas engines, and accumulators as back ups for temporary power changes in the solar panel field. The power grid will have an intelligent grid structure and control system. Maintaining the quality and availability of power throughout the transition in the production of renewable energy is a key part of the project. Automated solutions that enable the micro grid to function independently, as part of a public grid or in support of the national grid, will be applied in the management of the micro grid.

The goal of the heating plant to be constructed in Lempäälä is to reduce the space needed for processing fuels, enabling the construction of heating plants closer to their places of consumption, which in turn reduces the need for transportation related to energy production. Bringing heat production closer to where it is consumed also contributes to the reduction of distribution and transmission losses. In addition, the use of fossil fuels will be replaced by renewable energy use at the Viialantie heating plant. Furthermore, the mobile storage facility to be constructed at the heating plant will enable the flexible production of energy locally, without the construction of large fuel reception facilities.

Sustainable public transportation

225,000
ESTIMATED DAILY NUMBER OF USERS OF RAIL TRANSPORT

3,665.7
ANNUAL CO_2 EMISSIONS AVOIDED (tCO_2)

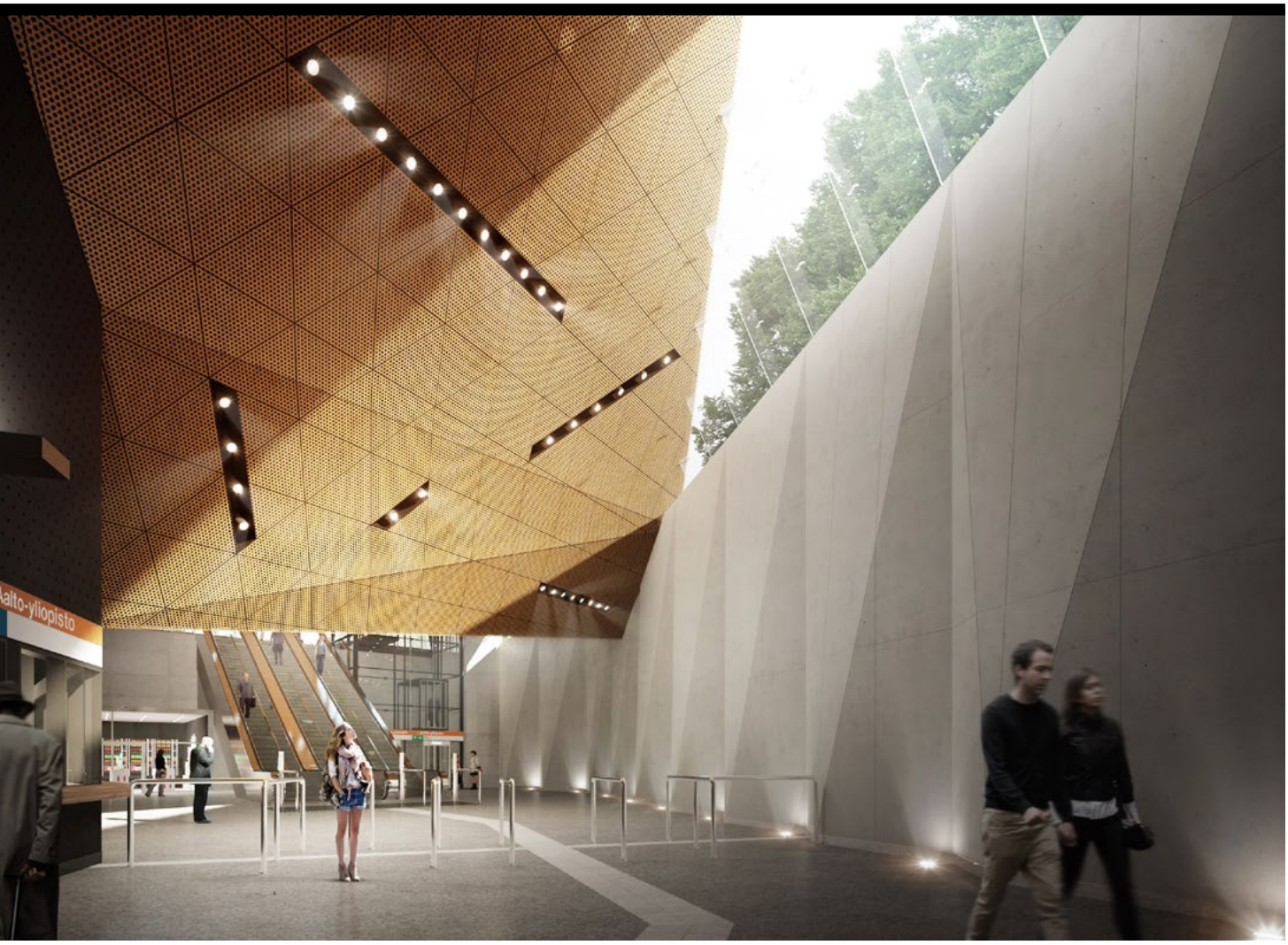
3
NUMBER OF PROJECTS

In 2017, MuniFin financed two major national public transportation projects: the Western Metro Extension between Ruoholahti and Matinkylä in the Helsinki Capital Region, and the new tramway in Tampere. In addition to these two projects, MuniFin financed the acquisition of an electric van for the City of Nurmes as part of the Green Framework's "Sähköistetään Suomen autot!" campaign (for making all cars in Finland electric). MuniFin is contributing to increasing the use of electric vehicles and the transition of municipalities towards becoming carbon-neutral by offering them the opportunity to acquire electric vehicles with zero-margin leasing financing.

Based on MuniFin's contribution, the weighted amount of CO_2 emissions avoided, when calculated for sustainable public transportation projects, is roughly 3,665.7 tCO_2. Based on the surveys conducted, the estimated total combined number of users of the Western Metro Extension and the Tampere Tramway project is 225,000 people. The indirect effects of public transportation projects often significantly outweigh their direct calculated effects. The projects enable issues such as more environmentally friendly urban development, the diversification of the city structure, densified housing production, and expanding the city beyond its traditional central area. Furthermore, new modes of sustainable transport have a wide range of effects on the everyday lives and well-being of people.

In addition to the calculated positive environmental impact, the related projects have broader social and economic effects:

- Functional public transport enables the densification of urban areas as housing production and services become centralised around public transport nodes. As opposed to spread land use, densifying land usage and city structures helps to reduce energy consumption in the community, thus creating indirect emission avoidance through new, sustainable public transport solutions.
- Public transport improves the perceived fluency of everyday services through greater accessibility and more accurate travel times. Optimising public transport makes travelling between homes and workplaces, schools and other public services easier, thereby reducing the time that people spend travelling on a daily basis.
- Rail transport solutions replace the consumption of fossil fuels while reducing private car use and traffic in urban areas. This has an impact on how pleasant a city is perceived to be, as well as on people's health through improvements such as less peak traffic and better air quality.
- Modern public transport solutions are fully accessible by people who travel with strollers, people in wheelchairs, visually impaired people, and people with reduced mobility.
- Both metro and tram lines reduce noise pollution in urban environments, as well as being safe modes of transport.



The West Metro extension's new metro line between Ruoholahti and Matinkylä is a fast mode of transport that improves public transport connections between Helsinki and Espoo as well as regionally. Other ecological features of the metro include its large capacity and durability. One metro car holds the same number of passengers as 700 cars. In addition, the West Metro extension travels its entire distance deep underground and therefore has no direct impact on the environment.

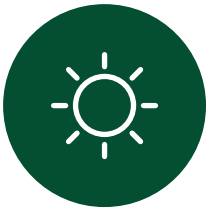
The Tampere Tramway is being built to serve the busiest sections of the public transport network and the city's fastest growing areas. The first phase of the tramway project will involve building tram lines that run east from Pyynikintori square in the city centre to the Hervanta district and Tampere University Hospital. The total length of the first phase of the tramway is 15 kilometres. The first phase of the tramway is planned to open in 2021. Furthermore, new residential areas can also be planned along the tram lines as the tramway will attract additional residential buildings, commercial services and workplaces.

The capacity of one tramcar is approximately three times that of a conventional bus. Based on their service life and capacity, 225 buses would be needed to match the service volume of 25 tramcars. From the viewpoint of the energy efficiency of traffic, the implementation of the tramway supports the city's strategic goals relating to the environment, i.e., reducing the energy consumption and emissions of traffic. Furthermore, the streets and the urban environment will become more pleasant as a result of improved conditions for walking, cycling and use of public transport, as well as a reduction in traffic-induced noise, dust and vibration.

Water purification and wastewater treatment

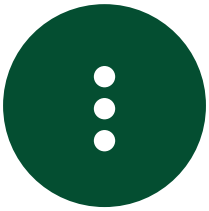
3,000,000

ANNUAL AMOUNT OF TREATED WASTEWATER (l/m³)



900

ANNUAL PRODUCTION OF RENEWABLE ENERGY (MWh) *



1

NUMBER OF PROJECTS

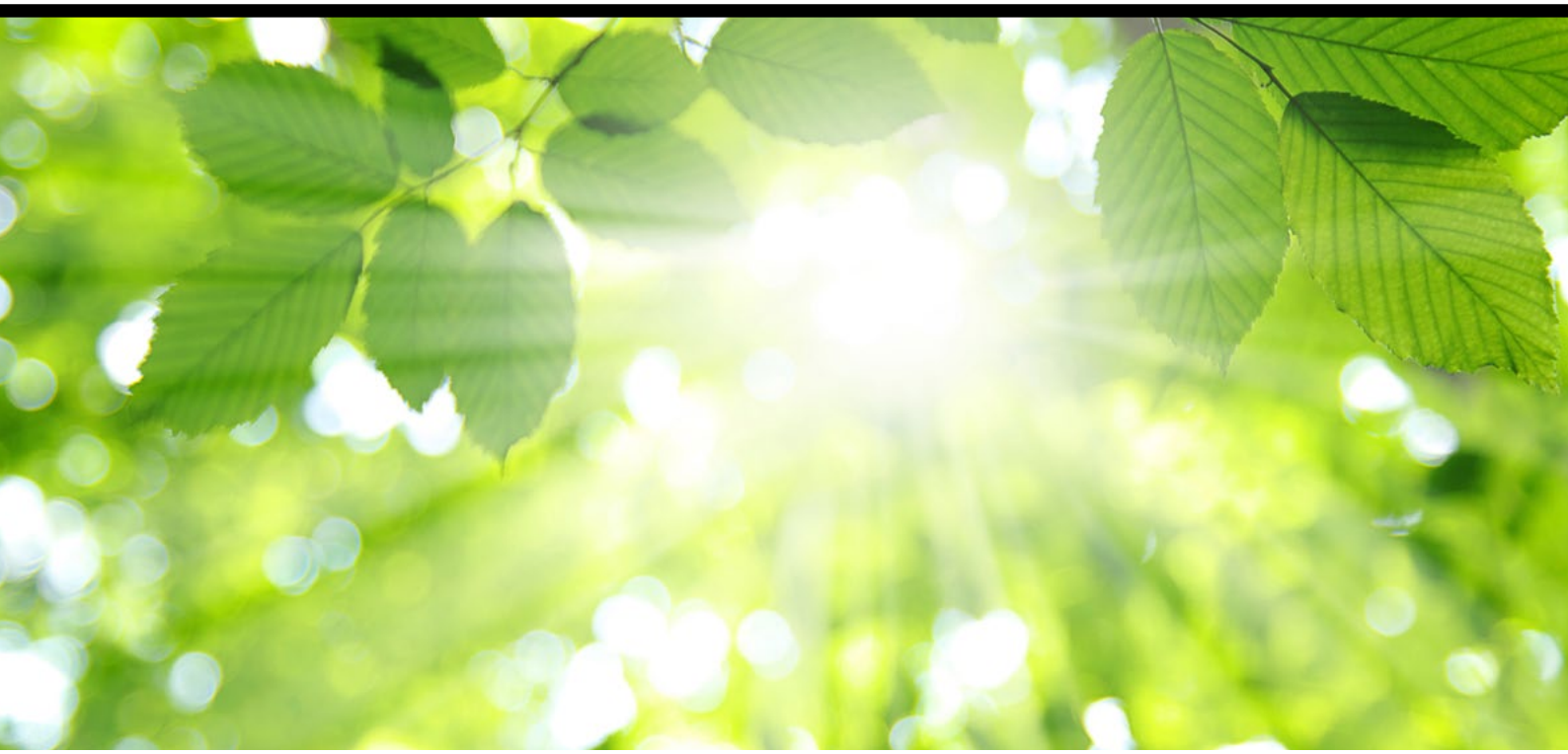
MuniFin is providing financing for the new Kalajokilaakso central treatment plant under construction in Kalajoki. The new central treatment plant will replace several old wastewater treatment plants. When the plant is operational, its capacity will be around 3 million litres of wastewater a year. The central treatment plant will also include a biogas plant for the further processing and recovery of wastewater sludge. The biogas plant will be operated by an external service provider and according to their estimates, the plant's annual energy production will be 900 MWh. Additionally, the new wastewater treatment plant will have a wastewater heat recovery process that will recycle heat for reuse inside the plant.

The new central treatment plant in Kalajoki will be a contemporary biological-chemical treatment plant. Construction is planned for completion in 2018. In the initial phase, wastewater derived from the sewage systems of the cities of Kalajoki and Ylivieska and the municipalities of Alavieska and Sievi will be treated at the central treatment plant. The treatment plant will be expanded in the early 2020s, after which its capacity will also cover the cities of Haapajärvi and Nivala.

The goal of the project is to improve the water quality of the Kalajoki River. The current wastewater treatment plants were built in the 1970s. The new central treatment plant's modern technological solutions will enable the fulfilment of ever-stricter requirements for water purification and wastewater treatment. No numerical requirements have been set by the licencing authority regarding nitrogen removal, because the enhanced removal of nitrogen from cold wastewater is challenging and expensive. In the Bothnian Bay, eutrophication is regulated by phosphorus rather than nitrogen. The effective removal of phosphorus from wastewater is therefore important from the perspective of the receiving water bodies. In the terms and conditions of the environmental permit, the maximum concentration of total phosphorus is 0.5 mg/l and the minimum efficiency requirement is 90%. The minimum efficiency requirement will be 95% from two years after the plant becomes operational. In terms of construction and use, a single central treatment plant is much more cost-effective than having several, small treatment plants located at a distance from one another. Once the central treatment plant is in operation, wastewater originating in built-up areas will no longer be discharged into the Kalajoki River after purification. In addition, a significant portion of the residential buildings situated along the river can be connected to the newly-built sewage system, either directly or through local main sewer lines.

** Computational estimate; biogasification provided by external service provider*

Calculation principles



The calculations presented in the report are based on the guidance provided in the *Position Paper on Green Bond Impact Reporting* drawn up jointly by a group of Nordic public sector issuers. Information from public sources (e.g. the emission factors) as well as data and reports directly related to the projects (e.g. project-specific environmental calculations) have been used in the calculations. Where necessary, the information has been supplemented by requesting further information from the parties that implemented the projects. The weighted impact has been calculated on the basis of MuniFin's share of the total investment in each project.

Emission factors used in the calculations:

- In the calculations, the emission factor for electricity is 380 g CO_2 based on the harmonised Nordic recommendations for green bond reporting (*Nordic Public Sector Issuers: Position Paper on Green Bonds Impact Reporting, 2017*)
- The emission factor for district heat based on project locations is calculated using values for the total or separate production of district heat as reported by Motiva (*www.motiva.fi*)
- Emission factors relating to traffic and transport are based on LIPASTO – a calculation system for traffic exhaust gas emissions and energy consumption in Finland (*www.lipasto.vtt.fi*)
- With regard to projects whose estimated impact is based on the calculation results presented in project-specific environmental reports, the emission factors are those used in the original calculations.

CALCULATION PRINCIPLES BY PROJECT CATEGORY

Sustainable buildings

Annual energy efficiency improvements and the amount of avoided CO_2 emissions are assessed in relation to applicable energy efficiency regulation in Finland. The energy efficiency of a building is presented as an E-value. The Finnish building code has defined a building-type-specific maximum E-value, which a new building should not exceed in order to gain a building permit. The maximum E-value allowed for a new building is used as the basis for calculating the energy efficiency of buildings.

The E-value represents a building's annual consumption of purchased energy, according to the heated net area (kWh/m2a) and based on the standard use of the building type and the weighted factors of the energy sources used. In the evaluation, solar or wind energy generated on the property is treated as a reduction in demand for purchased energy.

The estimated emission avoidance impact is calculated by using the emission factors for the production of electricity and district heat. Different forms of energy are weighted according to their proportions presented in the building's energy certificate. The emission factor for electricity in the calculations is 380 g CO_2/kWh. The values for total or separate production of district heat reported by Motiva are used in district heat calculations, based on the project locations.

Energy efficiency

The annual improvement of energy efficiency and amount of CO_2 emissions avoided is evaluated through the reduction of energy use in relation to a replacement solution, which serves as the baseline for the calculations. The annual estimated energy savings are based on the savings calculations carried out in the projects.

The estimated amount of CO_2 emissions avoided is calculated by using the emission factors for electricity and district heat production. The emission factor for electricity in the calculations is 380 g CO_2/kWh. The values for total or separate production of district heat reported by Motiva are used in district heat calculations, based on the project locations.

Renewable energy

In the renewable energy category, the amount of CO_2 emissions avoided is based on the emission calculations carried out during the planning phases of the Viialantie heating plant and Energy Self-sufficient Lempäälä projects, and the estimated amount of CO_2 emissions that can be avoided through the project in question.

The estimated annual production of renewable energy is based on additional information requested from the energy company Lempäälän Energia Oy on the different forms of energy production and estimated energy production of the Energy Self-sufficient Lempäälä project. With regards to fuel cells and gas engines, the estimated total production is weighted using the percentage share of biogas, which is estimated to be 50% on the basis of the target set for biogas use.

Public transportation

With regards to public transportation, the amount of CO_2 emissions avoided is based on the emission calculations carried out during the planning phases of the Western Metro Extension and Tampere Tramway projects, and the estimated amount of CO_2 emissions that can be avoided through the project in question. The estimated amount of CO_2 emissions avoided has been weighted using MuniFin's share of the total investment.

The avoided CO_2 emissions of the electric vehicle for the City of Nurmes were calculated by comparing the emissions of a diesel van and an electric car. The values used in the calculation were the emission factor for electricity (380 g CO_2/kWh), as well as the emission factor for diesel fuel (265 g CO_2/kWh) and the energy consumption of an electric passenger car (0.19 kWh/km) and a diesel van (0.97 kWh/km) derived from the databases of Motiva and the LIPASTO system. The City of Nurmes was requested to provide an estimate of the number of kilometres driven each year.

Water purification and wastewater treatment

The information used to evaluate the impact of the Kalajokilaakso central wastewater treatment plant is based on information on the annual amounts of wastewater treated at the plant and the estimated energy production of the biogas plant, which was requested from Vesikolmio Ltd, the company implementing the project.

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