Kommuninvest

Green Bonds Impact Report, December 2016

Report on 81 Swedish local government investment projects financed by Kommuninvest Green Bonds as of year-end 2016.

KOMMUNINVEST

The Sustainable Development Goals (SDGs), officially known as *Transforming our world: the 2030 Agenda for Sustainable Development*, are a set of seventeen aspirational global goals, with 169 specific targets, adopted through a United Nations resolution in September 2015. The Kommuninvest Green Bonds Framework addresses six of the SDGs, as presented below.

- **#6** Clean Water and Sanitation
- **#7** Affordable and Clean Energy
- **#9** Industry, Innovation and Infrastructure
- **#11** Sustainable Cities and Communities
- **#13** Climate Action
- **#15** Life on Land

About Kommuninvest

Kommuninvest is a Swedish municipal cooperation set up in 1986 to provide cost-efficient and sustainable financing for local government investments in housing, infrastructure, schools, hospitals etc. The cooperation comprises 288 out of Sweden's 310 local governments, of which 277 municipalities and 11 county councils/regions. Kommuninvest is the largest lender to the Swedish local government sector and the sixth largest credit institution in Sweden. At year-end 2016, total assets were SEK 362 billion, with a loan portfolio of SEK 277 billion. The head office is located in Örebro.

kommuninvest.se

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Foreword by the Kommuninvest Green Bonds Environmental Committee

Dear reader,

It gives us great pleasure to provide you with this first green bonds impact report, following the introduction of Kommuninvest Green Loans to clients in 2015, the subsequent build-up of a portfolio of eligible assets, and the issuance of two green bonds throughout 2016. The objective of this report is to provide investors and other stakeholders with information on the impact of some 80 Swedish local government investment projects financed under the Kommuninvest Green Bonds Framework by year-end 2016.

All projects financed have been reviewed by us, the Kommuninvest Green Bonds Environmental Committee[1], for compliance with the Framework's sustainability criteria. The Committee's role is to audit and finally approve Green Loan applications, review and decide on Green Loans and green bonds impact reporting as well as to serve as an advisory board and participate in the development of framework.

The Kommuninvest Green Bonds Framework was set up to support and promote climate change action within the Swedish local government sector as well as to provide all local governments with access to green financing for green investments. To that end, we deem the launch of the framework a success. By year-end 2016, the Committee had approved SEK 17.8 bn in Green Loans to 81 investment projects located in 48 Swedish municipalities. Two green bonds have been launched to great demand. As this impact report shows, the project impacts correspond to considerable reduced and avoided CO_2 emissions from renewable energy generation and energy efficiency in buildings and energy systems, as well as additional environmental impact from water management, public transportation and waste management projects.

As Sweden's largest lender to the local government sector, Kommuninvest has both an opportunity and a responsibility to support its owners and customers in their efforts to transition to a fully sustainable society. Our Green Loans and green bonds journey has just started and we look forward to continue to build this platform, in close collaboration with clients, investors and other stakeholders.

1 From left to right: Hanna Arneson, Sustainability Mgr, Municipality of Örebro; Björn Söderlundh, Head of Lending, Kommuninvest; Petra Mangnäs, Client Advisor, Kommuninvest; Marta Fallgren, Env. Mgr, Uppsala County Council; Andreas Hagnell, Senior Advisor Environment and Energy, Swedish Association of Local Authorities and Regions; Susanne Arneborg, Energy Coordinator, Municipality of Borås; Sara Pettersson, Urban Development Officer, City of Gothenburg.

2016 report highlights

Green Bonds: Two Kommuninvest Green Bonds issued in USD and SEK, totalling SEK 10.0 billion, of which SEK 10.0 billion was outstanding as of 31 December, 2016.

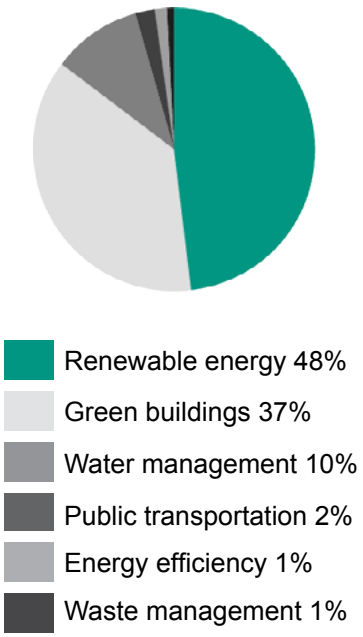
Eligible Green Bond Projects: 81 Green Bond Eligible Projects with commitments totalling SEK 17.8 billion and disbursements totaling SEK 14.5 billion at 31 December, 2016.

Examples of Impact Results

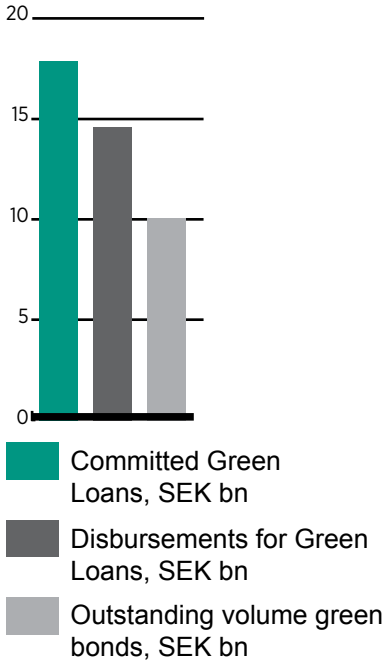
- SEK 8.6 billion in commitments (SEK 7.1 bn in disbursements) to 27 renewable energy projects is expected to result in 1.7 TWh of annual renewable energy generation. This corresponds to the avoidance of more than 395,730 tonnes in annual CO_2 emissions.
- SEK 6.6 billion in commitments (SEK 6.0 bn in disbursements) to 41 projects in green buildings, expected to generate 14.8 GWh of energy savings and resulting in an expected annual reduction in CO_2 emissions corresponding to 2,020 tonnes. On average, the funded residential projects are expected to consume 43 % less energy than required by the national Swedish building regulations, with an average energy consumption of 63 kWh per sq.m., while the funded non-residential projects are expected to consume 46 % less energy, with an average energy consumption of 64 kWh per sq.m.
- SEK 0.2 bn in commitments (SEK 0.2 bn in disbursements) to three energy efficiency projects, expected to result in 21,510 tonnes in annual CO_2 emissions savings. Projects are related to energy efficiency measures in local district heating systems.
- SEK 2.4 billion in commitments (SEK 1.2 bn in disbursements) to ten projects in areas encompassing water management, public transportation, energy efficiency and waste management. The impact of these projects is broadbased, and includes:

- a reduction in harmful substances from wastewater treatment and expansion of access to municipal wastewater for additional 23,000 people (PEs);
- increased capacity of local public transport networks and 6 million car kilometres avoided;
- improved waste management and energy extraction by optical sorting.

Committed Green Loans by category
31 Dec 2016



Green Loans and green bonds
31 Dec 2016



Green bond issuance

As of 31 December 2016, Kommuninvest[2] had issued two green bonds, for a total of SEK 10.0 bn. The inaugural green bond, a 3-year USD 600 million transaction, was issued in March 2016. The second bond, and the first to be issued in SEK, was issued in October 2016, a short 4-year transaction amounting to SEK 5 billion.

These two transactions are to date the two largest green bonds issued out of the Nordic countries. Funds raised by Kommuninvest green bonds support the transition to low-carbon and climate resilient growth, by financing climate friendly investments projects undertaken by Swedish local governments. For the 2016 funding year, 10 percent of Kommuninvest's long-term funding, ie. funding with a maturity exceeding one year, was in the form of green bonds, compared with 0 percent in 2015.

Kommuninvest green bonds are rated AAA/Aaa by S&P Global Ratings and Moody's, similar to Kommuninvest's other outstanding bonds. In July and October 2016, the rating institutes confirmed Kommuninvest's credit rating, with a stable outlook. The rating agencies highlight the joint and several guarantee undertaking by Kommuninvest's ultimate owners (288 Swedish local governments), the robust liquidity reserve with access to central bank funding, and the high quality of the loan portfolio.

Kommuninvest green bonds

Issue date	Amount issued	Maturity	Coupon	ISIN
15 March 2016	USD 600 mn	23 April, 2019	1.50% (semi-annually)	XS1383831648 (RegS) US50046PAU93 (144A)
16 October 2016	SEK 5 billion	5 May, 2020	0.00% (annually)	XS1508534861

Use of proceeds reporting

Kommuninvest's Green Bonds finance investment projects undertaken by our member municipalities and county councils/regions. Eligible projects must:

- promote the transition to a low-carbon and climate-resilient society;
- be part of the systematic environmental work in the applicant municipality or county council/region;
- be related to Sweden's national environmental objectives, or to regional environmental goals.

Eligible projects target:
(a) mitigation of climate change, including investments in low-carbon and clean technologies, or
(b) adaptation to climate change, including investments in climate-resilient growth, or
(c) projects related to environmental management in other areas than climate change (max. 30 percent of issued volume).

On 31 December 2016, Kommuninvest had committed SEK 17.8 billion in funding for 81 green investment projects. The total disbursements were SEK 14.5 billion.

Projects in the categories Renewable energy and Green Buildings accounted for 85 percent of commitments on 31 December 2016, and 90 percent of disbursements). Water management projects accounted for 10 percent of commitments, while Public transportation projects and Energy efficiency projects accounted for 2 and 1 percent, respectively. Waste management projects accounted for less than 1 percent while there had been no applications for projects in the Adaptation measures and Environmental management categories.

[2] Kommuninvest refers to Kommuninvest i Sverige AB (publ), a credit market company which is wholly owned by the Kommuninvest Cooperative Society and explicitly guaranteed by the Society's members, 288 Swedish local governments.

Commitments by category

Project category	Committed, SEK mn	Disbursed, SEK mn	# projects
Renewable energy	8,581	7,099	23 (27)*
Energy efficiency	235	241	3
Green buildings and energy efficiency	6,604	6,007	41
Public transportation	417	416	3
Waste management	125	125	1
Water management	1,820	635	6
Adaption measures	0	0	0
Environmental management	0	0	0
Total	17,782	14,524	77 (81)

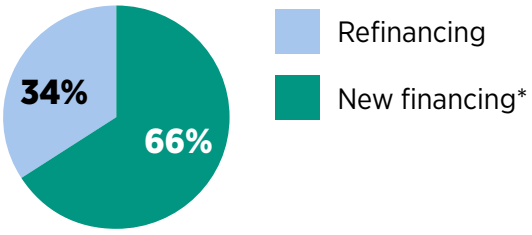
**A number of Eligible Projects refer to the same physical investment project. As a consequence, the project-by-project impact reporting, on pages 13-17 in this document, comprise 23 projects, compared with the 27 projects for which funding has been provided.*

Note: Committed and disbursed amounts as per 31 December 2016.

New and refinanced projects

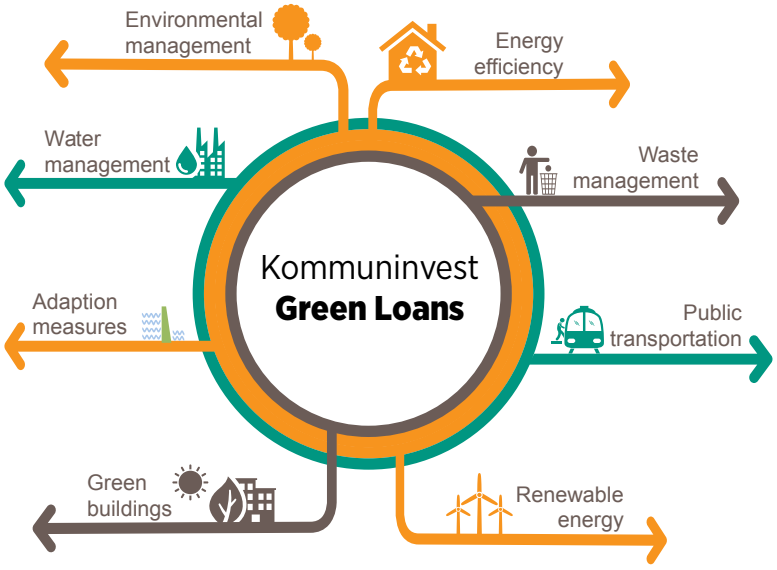
The Kommuninvest Green Bonds Framework allows for financing of both new and completed projects. Our ambition is for the majority of the Green Bonds proceeds to be allocated to new projects (projects that were either planned, on-going or finalised within nine months before the green bond issuance date). The actual distribution between new and refinanced projects as of 31 December 2016 is presented below.

SEK 17.8 bn in committed funds



**Project is planned, on-going or a maximum of nine months has passed since completion.*

Eligible project categories



Process for project evaluation and selection

Green Loan applications from Kommuninvest clients are reviewed and finally approved by an advisory committee – the Kommuninvest Green Bonds Environmental Committee – comprising Swedish local
government climate specialists.

Investment projects are initially identified, verified and selected by the environmental functions and treasury departments in Kommuninvest's member municipalities/county councils. Eligible projects are then screened by Kommuninvest's Lending department, and, on a quarterly basis, reviewed and finally approved by consensus vote in the Kommuninvest Green Bonds Environmental Committee.

The Committee consists of representatives from the environmental function of two or more member municipalities and county councils/regions, environmental experts from other relevant public sector organisations or academia/non-governmental organization, and from Kommuninvest's management and lending group.

Eligible project categories

Eligible projects are Swedish local government investment projects in the fields of

* Renewable energy
* Energy efficiency
* Green buildings
* Public transportation
* Waste management
* Water management
* Adaptation measures in buildings, infrastructure and sensitive surroundings
* Environmental management.

Committee members

- Andreas Hagnell, Senior Advisor Environment and Energy, Swedish Association of Local Authorities and Regions (SALAR)
- Susanne Arneborg, Energy Coordinator, Municipality of Borås
- Marta Fallgren, Environmental Manager, Uppsala County Council
- Sara Pettersson, Urban Development Officer (with focus on Climate and Environment), City of Gothenburg
- Hanna Arneson, Sustainability Manager, Municipality of Örebro
- Björn Söderlundh, Head of Lending, Kommuninvest
- Petra Mangnäs, Client Advisor, Kommuninvest

For further information on the Committee members, see the green bond section of Kommuninvest's webpage.

Impact reporting

The purpose of this impact report is to illustrate the positive climate and environmental impacts that have resulted or are projected to result from projects financed within Kommuninvest's Green Bonds framework for Green Bonds. Kommuninvest is committed to transparent reporting and conservative assessments when reporting these results.

A number of key result indicators including indicators targeting renewable energy generation, energy savings and reduced and avoided GHG emissions have been selected and where possible quantified. However, it is important to consider the following aspects in order to adequately interpret the reported results:

- Uncertainty and comparability: Estimations of impact indicators and projections of impacts are based on certain assumptions. Kommuninvest aims to make sound, conservative and reasonable assumptions based on, inter alia, current information and data provided by its borrowers. Actual results may differ from initial projections as a result of changes in legal requirements, baseline conditions, behavior and slow start-up periods.
- Qualitative results: The projects listed within this report may have impacts across a wider range of indicators than those included in this report. Where quantitative data is unavailable, qualitative data, to the extent possible have been included to illustrate the type and direction of other beneficial impacts.
- Ex-ante and ex-post: Both impact analysis (ex-ante) and impact reporting (ex-post) will be used to report the impacts of a project. Kommuninvest aims to report actual results where feasible, and has included information to that effect in the project disclosure tables below. In line with the requirements of the Kommuninvest Green Bonds Framework, all Eligible Projects must promote the transition to a low-carbon and climate-resilient society.

The impact indicators summarized in this report focus on results deemed relevant to Green Bond investors, and seeks to be aligned with recommendations as outlined in the IFI Harmonized Framework for Impact Reporting[3] , published by a group of international financial institutions. The indicators are intended to illustrate the type and scale of expected results in a variety of projects. It is important to note that, because of the wide range of project areas, comparability between projects (and other project portfolios) may be limited.

Scope

At this stage, Kommuninvest report impact on Scope 1 and Scope 2 emissions, ie. including all direct GHG emission as well as indirect GHG emissions from consumption of purchased electricity, heat, cooling or steam.

Approach

The impact of Eligible Projects funded by Kommuninvest can be calculated in a number of ways:

- by reference to the reduction in energy consumption or added renewable energy capacity, and thus the greenhouse gas emissions avoided as a result of energy savings or crowding out dirtier alternatives ("mitigation projects")
- the contribution made to strengthening local adaptation to climate change ("adaptation projects").
- the environmental benefits achieved in other ways than through mitigation or adaptation measures ("environmental management projects").

As of 31 December 2016, 49 percent of the disbursements were for Renewable energy projects and 41 percent for projects in the category Green buildings and energy efficiency.

To calculate the climate and environmental impact of a greenhouse gas mitigation investment, the completed project has to be compared with an alternative scenario. In some cases, it will be appropriate to consider the investment in relation to a base scenario – a reference scenario in which the investment does not exist. In such cases the calculation will be as follows:

[3] International Financial Institutions (IFIs): *Green Bonds, Working Towards a Harmonized Framework for Impact Reporting*, December 2015

Annual climate impact = (emissions produced or energy consumed by the project in a baseline scenario) - (emissions produced or energy consumed by the project after the investment has been completed).

In other cases, for example where the project financed is a new building, the approach is to assume that the investment will be undertaken regardless but that the borrower may choose to adhere to less strict climate standards. In such instances the climate impact is calculated on the basis of an alternative scenario in which the investment meets the minimum requirements contained in the applicable building regulations. The calculation will then be as follows:

Annual climate impact = (emissions produced or energy consumed by an equivalent investment if minimum standards were followed) – (emissions produced or energy consumed by the project after the investment has been completed).

A detailed disclosure of methodologies that have been deployed in this impact report is provided in the Appendix.

Impact disclosed in relation to financed portion

This report illustrates the expected or realized environmental impact made possible as a result of projects to which green bond proceeds have been allocated. When we report impact, we do so in relation to the share of Kommuninvest financing for the project's total investment cost, and to actual disbursements to the project.

Impact per invested SEK

Measuring the impact of a green investment project in relation to the money that has been invested is a clear and simple metric to evaluate green bonds. However, it fails to recognize that some green bond frameworks are broad in scope, targeting environmental project categories that do not provide impacts that are quantifiable in CO_2. For Kommuninvest, this applies to the project categories water management, adaptation measures and environmental management.

We therefore report impact per invested SEK for investment projects or project categories where the CO_2-impact is quantifiable and relevant. For conservative purposes, we report impact based on amounts disbursed to a project (as opposed to amounts committed). If disbursements are made gradually, environmental impact will also be taken into account gradually. In cases where no disbursements have been made to a project, the environmental benefit for that project will be recognised as zero.

Project category	GHG emissions reduced/ avoided, tonnes CO_2e/ year	Disbursements, SEK mn	Impact, tonnes CO_2e per SEK mn
Renewable energy	395,733	7,099	56
Energy efficiency	21,511	241	89
Green buildings and energy efficiency	2,018	6,007	0.3
Public transportation	732	416	2
Waste management	500	125	4
Water management	n/a	635	n/a
Adaption measures	n/a	0	n/a
Environmental management	n/a	0	n/a
Total GHG emissions reduced/avoided, tonnes CO_2e			**420,494**
Total disbursements, SEK million			**14,524**
% of disbursements with quantified CO_2 impact			**96%**

Baselines for CO_2 emissions

Deciding upon a baseline emission factor against which the environmental impact can be measured is important, since the chosen baseline will determine the calculated environmental benefits. The disclosure of baselines used in this report is available on page 19.

This section highlights the overarching fundamental choices made by Kommuninvest for the two largest project categories of the Framework, Renewable energy and Green buildings and energy efficiency.

For electricity, Kommuninvest has chosen a mainland European mix, including 26 European Union countries as well as Norway, as the relevant baseline. The rationale is that a non-negligible interconnection and export surplus from the Nordic countries to European energy markets exist already today and is planned to increase in the coming decades. This is also highlighted in a report published by the Nordic Council of Ministers and the International Energy Agency (IEA)[4] in 2016.

In line with the recommendations of the IFI Framework for a Harmonized Approach to Greenhouse Gas Reporting[5], we apply a Combined Margin (CM) for the grid that is comprised of an Operating Margin (OM) and a Build Margin (BM). However, Kommuninvest applies the same combination of the OM and BM for all projects.

For district heating systems, which are fundamentally local/regional and not interconnected on a national or Nordic basis, Kommuninvest has commissioned an external advisor to develop a baseline emission factor for district heating for Sweden, based on avoided mix of best available alternative heating technologies[6].

To calculate the impact and energy efficiency of buildings, the financed building is compared with the requirements of the Swedish national building code.

On Green Buildings

As per 31 December, 2016, 38 Green Building projects were financed under the Kommuninvest Green Bonds Framework, whereof 17 residential projects and 21 non-residential projects. The total energy use in the residential buildings, expected or actual, is 5,123 MWh per annum, or on average 63 kWh per sq.m and year (total heated surface area: 80,831 sq.m.). Had these buildings solely been built to meet national building regulations, total energy consumption would have been 9,047 MWh. Energy savings for the residential buildings thus amounts to a total of 3,924 MWh per annum.

For the non-residential buildings, the total expected or actual energy use is 9,426 MWh per annum, or on average 64 kWh per sq.m and year (total heated surface area: 146,884 sq.m.). Had these buildings solely been built to meet national building regulations, total energy consumption would have been 17,414 MWh. Energy savings for the non-residential buildings thus amounts to a total of 7,988 MWh per annum. For both residential and non-residential building projects the reference to the Swedish building regulation is to the regulation in force upon launch of the Green Bonds Framework (Boverket's Building regulations, BBR 21).

A comparison of impact per invested SEK between the Renewable Energy and Green Building project categories indicate a considerably higher CO_2e impact for the former vs. the latter. A couple of perspectives are relevant here. Firstly, the primary purpose of a new building is to provide a specific function as a residential or non-residential building. Energy savings are important, however not the primary objective of the investment. This is in contrast to renewable energy investments, where the energy production is in focus. Secondly, the majority of green buildings financed by Kommuninvest are heated through district heating. This means that the major part of energy savings are calculated against a baseline of 59 kg CO_2 per MWh, instead of the 380 kg CO_2 per MWh used for electricity savings.

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[4] District heating is a system for distributing heat generated in a centralized location for residential and commercial heating requirements. In the Nordic countries, the heat is often obtained from a cogeneration plant burning principally renewable energy sources, including biomass, but plants also use waste and excess heat, and to a minor extent, fossil fuels. District heating plants may also be used to produce electricity (combined power and heating plants, CHP), and cooling.

[5] International Financial Institution (IFI) Framework for a Harmonized Approach to Greenhouse Gas Accounting, November 2015; Green Bonds, Working Towards a Harmonized Framework for Impact Reporting, December 2015.

[6] Profu memorandum (in Swedish only): ”Stöd till klimatutvärdering av gröna investeringar inom fjärrvärmeområdet”, February 2017. Interested parties can obtain this report by sending a request to: ir@kommuninvest.se

About this report

This report was written and compiled by:

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Any errors, omissions or otherwise are our responsibility.

Project impact reporting is based on data collected from financed projects during Q4-2016 and Q1-2017. The data has been reviewed by Kommuninvest however their accuracy has not been verified by neither Kommuninvest nor a third party. Climate impact calculations have been made by Kommuninvest, and their accuracy has not been verified by a third party.

The information has been reviewed and approved for publication by the Kommuninvest Environmental Committee, whose members are presented on page 6.

Joint Nordic issuer discussion on impact reporting

Kommuninvest forms part of a group of Nordic public sector issuers of green bonds[1] which during 2016 initiated discussions regarding a joint common approach to green bonds impact reporting. This was done in the belief that a common Nordic position to the issues involved may be beneficial to other green bond issuers as well as the investor community. Issuers also believe that sharing experiences and know-how will benefit all as individual issuers.

The purpose of our work is to develop a transparent, harmonized and relevant approach to report impact from green bonds. The group's ambition is to develop a practical guide for Nordic green bond issuers, for publication in the second half of 2017. The work is ongoing and the outcome of discussions has not yet been finalized. The outcome may have an effect on how we report impact in the future.

[1] *Participants (FI=Finland, NO=Norway, SE=Sweden): City of Göteborg (SE), Kommunalbanken (NO), Kommuninvest (SE), Municipality Finance (FI), Municipality of Borås (SE), Municipality of Norrköping (SE), Municipality of Örebro (SE), Stockholm County Council, SLL (SE), Swedish Export Credit Corporation, SEK (SE)*

Case: City of Umeå / A showcase for solutions to tackle climate change and reduce cities' ecological footprint

The city of Umeå in northern Sweden is the three-times finalist for the prestigious European Green Capital award, and in 2016 was Sweden's winner in WWF's Global Earth Hour City Challenge. With some SEK 1.8 billion in committed Green Loans and seven approved projects, Umeå is also one of the largest borrowers of Kommuninvest Green Loans.

The city has long since pursued an ambitious environmental agenda. City leaders emphasize cooperation, both with private and public local actors as well as other cities and countries. "This means that we can test and evaluate new technologies, new methods and tools that lead to reduced environmental impact," says Hans Lindberg, Chairman of the Municipal Board.

Among the projects financed by Kommuninvest, Umeå is pioneering several innovative solutions:

- A fully electrified public transport system using ultra fast-charging buses. Fully electric buses have been deployed since 2010 in the city. Kommuninvest Green Loans finances expansion with 8 buses and two charging stations. By 2020, the municipality aims to have more than 30 fully electrical buses in operation, and to have increased the share of electrified bus passenger kilometres to 70% of the total, up from 0% in 2010. Since electricity generation in Umeå is principally based on renewable energy sources, using electrical buses results in virtually zero emissions of greenhouse gases.
- The Hedlunda nursery school is the world's northern-most internationally certified passive house built as a nursery school. Total energy use for heating is in line with the certification requirements of max. 15 kWh per sq.m., an achievement given its geographic location.
- Scandinavia's largest plant for production of black pellets, based on an innovative torrefaction technology. Black pellets resemble fossile coal but is renewable and carbon neutral. Compared with traditional white pellets (also a renewable energy source), black pellets have a higher energy density and are easier to grind into powder for industrial use. This means 40-60% more energy content can be transported in each load, and energy savings of 70-90% are feasible when milling. The industrial demonstration unit has an annual capacity of 16,000 tonnes, equivalent to ~93,000 MWh. www.bioendev.se

Case: Green schools / Sustainable learning environments

As of 31 December 2016, Kommuninvest had contributed Green Loans financing for 20 schools across Sweden, making this type of project one of the most common for green financing by Swedish municipalities. Perhaps not surprisingly, given Sweden's rapidly growing population and a desire by local politicians to showcase sustainability efforts in the school environment.

Among the projects financed by Kommuninvest are several certified passive house constructions and a number of gold-certified buildings. Energy consumption is often at least 50 percent lower than the requirements set out in the Swedish building regulations. Many of the schools also display an attention to sustainability in the broader sense, by offering facilities that can be used outside of school hours, for cultural or sports activities or other[7].

The municipality of Skövde has funded the construction of five schools and preschools with Green Loans. According to the vice chairman of the city's municipal executive committee, Mr. Leif Walterum, public authorities play an important role in deploying new technology that propel environmental and energy efficiency efforts in society.

– Skövde municipality has made a conscious choice in imposing strict environmental and energy requirements when we build preschools and schools, for the sake of the future generation and to increase the appeal of the city. The fact that we can also finance these investments with Green Loans reinforces Skövde's environmental profile, he says.

Below are listed eight examples of sustainable learning environments from across Sweden.

Ale Krona school
Area: 10,624 sq.m.
students: 770
Energy use[8]: 31 kWh/sq.m.
Certification: FEBY12[9]
Completion: 2016

Järfälla Herresta school
Area: 7,852 sq.m.
students: 400
Energy use[8]: 41 kWh/sq.m.
Certification: Gold[10]
Completion: 2015

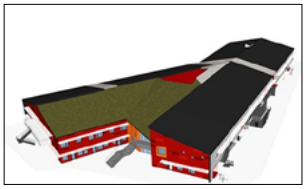
Knivsta Högås school
Area: 6,280 sq.m.
students: 470
Energy use[8]: 42 kWh/sq.m.
Certification: PHI[11]
Completion: 2015

Skara Viktoria school
Area: 10,374 sq.m.
students: 600
Energy use[8]: 35 kWh/sq.m.
Certification: Silver[12]
Completion: 2017

Skövde Billing school
Area: 5,097 sq.m.
students: 550
Energy use[8]: 58 kWh/sq.m.
Certification: Gold
Completion: 2014

Umeå Hedlunda preschool
Area: 1,583 sq.m.
students: 90
Energy use[8]: 15 kWh/sq.m.
Certification: -
Completion: 2014

Växjö Pär Lagerkvist school
Area: 13,068 sq.m.
students: 1000
Energy use[8]: 51 kWh/sq.m.
Certification: Gold
Completion: 2017



Älmhult Elme school
Area: ~ 9,000 sq.m.
students: 800
Energy use[8]: 21 kWh/sq.m.
Certification: -
Completion: 2017

[7] This may explain the differences in sq.m. per student in different schools. Kommuninvest solely makes a judgment of the energy efficiency per sq.m. and not how each sq.m. is used.
[8] Per year
[9] Swedish passive house certification
[10] Swedish: "Miljöbyggnad Guld"
[11] Passive House Institute, Germany
[12] Swedish: "Miljöbyggnad Silver"

Renewable energy #	Sub-category	Borrower	Project location	Project description	(A), (M) or (E) *	Project Completion	KI Share of Financing	Committed Amount	Disbursed Amount	Expected or Actual impact	Renewable energy generation **	GHG-emissions reduced / avoided ***
						Year	*%*	*MSEK*	*MSEK*		*MWh*	*Tonnes of CO2e/year*
7	Bioenergy	Biogasbolaget i Mellansverige AB (Biogas Company of Mid-Sweden)	Karlskoga	Facility for biogas production located at Mosserud recycling station in Gottebol	(M)	2014	32%	49	49	Actual	7 737	1 741
14	Bioenergy	Gävle municipality	Gävle	Forsbacka biogas production facility	(M)	2018	94%	120	80	Expected	17 008	3 827
37	Bioenergy	Umeå Kommun (Umeå Municipality)	Umeå	Investment in commercial scale torrefaction unit for production of black pellets, at municipal subsidiary BioEndev.	(M)	2016	100%	54	0	Expected	0	0
4	District Heating	Karlstad municipality	Karlstad	Heden 3 - new bio-fuelled combined power and heating plant (district heating)	(M)	2015	100%	900	900	Actual	12 461	12 653
5	District Heating	Borås municipality	Borås	Sobacken - new bio-fuelled combined power and heating plant (district heating)	(M)	2019	77%	1 400	1 000	Expected	44 199	14 320
13	District Heating	Karlskoga Energi & Miljö AB (Karlskoga Energy & Environment Company)	Karlskoga	Facilities for district heating, including combined power and heating plant and distribution pipelines.	(M)	1985	22%	190	190	Actual	47 158	5 850
49	District Heating	Arvika Fjärrvärme AB (Arvika District Heating Company)	Arvika	Investment in district heating company, installed capacity 74 MW.	(M)	2010	100%	127	102	Actual	90 471	8 816
56	District Heating	Lessebo kommun (Lessebo municipality)	Lessebo	Expansion of biofuels-based district heating plant	(M)	2006	76%	177	167	Expected	720	70
64	District Heating	Mjölby-Svartådalen Energi AB (Mjölby Energy Company)	Mjölby	Expansion of biofuels-based combined power and district heating plant in Mjölby.	(M)	2016	54%	216	216	Expected	79 089	13 348
68	District Heating	Vimmerby Energi och Miljö AB (Vimmerby Municipal Energy Co. AB)	Vimmerby	New biofuels-based combined power and heating plant at Tallholmen.	(M)	2016	100%	520	160	Actual	46 154	5 892
81,93	District Heating	Norrenergi (Solna and Sundbyberg Municipal Energy Company)	Solna	Balance sheet financing. 99% of Norrenergi energy production is from renewable sources.	(M)	2004	100%	1 250	945	Actual	709 884	69 174
23,52,53	District Heating	Botkyrka and Huddinge municipalities, partly through Södertörns Energi AB	Botkyrka	District heating, district cooling and electricity for the Botkyrka, Huddinge and Salem municipalities.	(M)	2008	100%	1 910	1 810	Expected	211 550	39 722
12	Hydropower	Karlskoga Energi & Miljö AB (Karlskoga Energy & Environment Company)	Hällefors	Refinancing of 24 existing small scale hydropower plants. Total annual production (normalised): 100,600 MWh, equivalent to heating 6,700 houses.	(M)	2012	68%	250	250	Actual	89 139	33 873
51	Hydropower	Arvika Fjärrvärme AB (Arvika District Heating Company)	Arvika	Investment in 26 existing hydro power stations.	(M)	2012	100%	60	45	Expected	55 500	21 090
50	Solar energy	Arvika Fjärrvärme AB (Arvika District Heating Company)	Arvika	Construction of solar energy production facility, expected annual production 1 MWh.	(M)	2015	100%	15	15	Expected	950	361
1	Wind Power	Eskilstuna municipality	Sollefteå	Four new wind power turbines	(M)	2015	100%	165	165	Expected	37 000	14 060
2,65	Wind Power	Skellefteå Stadshus (Skellefteå Municipality)	Sorsele	Blaiken wind power plant, phase 2, 3 and 4	(M)	2017	26%	829	829	Expected	181 912	69 127
33	Wind Power	KumBro Vind AB (Kumla and Örebro Municipal Wind Company)	Kumla	Co-financing for construction of wind farm with 16 turbines.	(M)	2015	39%	62	62	Expected	12 208	4 639
38	Wind Power	Umeå Kommun (Umeå Municipality)	Robertsfors	Three wind turbines with a total installed capacity of 9.6 MW.	(M)	2014	100%	123	0	Expected	0	0
45	Wind Power	Falu Energi & Vatten AB (Falun Energy & Water AB)	Falun	Five wind power turbines at Högberget, total capacity 10 MW (20% ownership).	(M)	2008	100%	30	18	Actual	4 080	1 550
46	Wind Power	Falu Energi & Vatten AB (Falun Energy & Water AB)	Falun	Five wind power turbines at Tavelberget, total capacity 10 MW (50% ownership).	(M)	2010	100%	82	82	Actual	17 800	6 764
47	Wind Power	Region Jämtland Härjedalen	Kalmar	Wind power turbine, capacity 3 MW	(M)	2014	100%	38	0	Actual	0	0
83	Wind Power	KumBro Vind AB (Örebro and Kumla Municipal Wind Comp. AB)	Hylte	Wind power turbines at Ryssbol, total capacity 13 MW	(M)	2015	84%	15	15	Expected	36 216	13 762
Subtotal for Renewable energy							**68%**	**8 581**	**7 099**		**1 743 088**	**395 733**

* (A)=Adaptation, (M)=Mitigation, (E)=Environmental Management

** Value represents Kommuninvest's share of the total renewable energy generation, based on disbursed amounts

*** Based on the share financed by Kommuninvest (disbursed amounts)

Green buildings and energy efficiency # Sub-category	Borrower	Project location	Type of building	Project description	(A), (M) or (E) *	Project Completion	KI Share of Financing	Disbursed /Total	Committed Amount	Disbursed Amount	Expected or Actual impact	Annual energy savings **	GHG-emissions reduced / avoided ***
						Year	*%*	*%*	*MSEK*	*MSEK*		*MWh*	*Tonnes of CO2e/year*
19 Energy Efficiency	Umeå municipality	Umeå	Residential	Energy efficiency measures in existing multi-family housing units, including Sustainable Ålidhem area	(M)	2015	100%	100%	276	276	Actual	3 991	426
20 New Buildings	Umeå municipality	Umeå	Residential	Production of new low-energy multi-family housing units, including Sustainable Ålidhem area	(M)	2015	100%	99%	675	671	Expected	2 303	236
21 New Buildings	Eksta Bostads AB (Eksta Housing AB)	Kungsbacka	Residential	Passive houses (Vallda Heberg geriatric care housing unit in Kungsbacka)	(M)	2014	92%	83%	119	107	Actual	427	59
22 New Buildings	Eksta Bostads AB (Eksta Housing AB)	Kungsbacka	Residential	Passive houses (Vallda Heberg senior housing units 55+ in Kungsbacka)	(M)	2014	92%	88%	77	73	Actual	104	9
25 New Buildings	Trosabygdens Bostad AB (Trosabygden Housing AB)	Trosa	Residential	Multi-family housing in Trosa. 16 apartments based on Kombo housing concept developed by SABO (the Swedish Association of Public Housing Companies)	(M)	2017	100%	98%	33	32	Expected	45	4
26 New Buildings	Fastigheter i Linde AB (Lindesberg Property AB)	Lindesberg	Residential	Multi-family housing in Lindesberg with 70 apartments (Ålkilsbacken)	(M)	2017	90%	90%	104	104	Expected	50	19
27 New Buildings	Härjegårdar Fastighets AB (Härjedalen Municipal Property Company AB)	Härjedalen	Residential	Multi-family housing in Skansen area, based on Kombo housing concept developed by SABO (the Swedish Association of Public Housing Companies)	(M)	2018	100%	100%	25	25	Expected	47	6
34 New Buildings	AB Karlsborgsbostäder (Karlsborg Municipal Housing AB)	Karlsborg	Residential	52 apartments in the Strömmen project, Skaraborg.	(M)	2017	100%	100%	100	100	Expected	122	16
35 New Buildings	Torsby Bostäder AB (Torsby Municipal Housing AB)	Torsby	Residential	Multi-family housing with 23 apartments in Torsby.	(M)	2016	83%	0%	25	0	Expected	0	0
39 New Buildings	AB Kristianstadsbyggen (Kristianstad Municipal Housing Company AB)	Kristianstad	Residential	Multi-family housing with 16 units in Vä area, based on Kombo housing concept developed by SABO (the Swedish Association of Public Housing Companies)	(M)	2016	100%	100%	26	26	Expected	44	5
40 New Buildings	AB Vingåkershem (Vingåker Municipal Housing AB)	Vingåker	Residential	Multi-family housing with 14 units in Vingåker, based on Kombo housing concept developed by SABO (the Swedish Association of Public Housing Companies)	(M)	2017	91%	91%	21	21	Expected	35	3
54 New Buildings	Malå kommun (Malå municipality)	Malå	Residential	Multi-family housing in Malå municipality, based on "Trygga Boendet" and Kombo housing concept developed by SABO (the Swedish Association of Public Housing Companies)	(M)	2017	100%	46%	37	17	Expected	66	25
59 New Buildings	Halmstads kommun (Halmstad municipality)	Halmstad	Residential	Energy-plus multi-family house in Lyngåkra.	(M)	2015	100%	100%	20	20	Expected	57	22
61 New Buildings	Vaggeryd-Skillingaryds Bostads AB (Vaggeryd-Skillingaryd Municipal Housing Company AB)	Vaggeryd	Residential	Multi-family housing with 16 units at Mjölnaren, based on Kombo housing concept developed by SABO.	(M)	2014	97%	97%	30	30	Expected	58	22
62 New Buildings	Vaggeryd-Skillingaryds Bostads AB (Vaggeryd-Skillingaryd Municipal Housing Company AB)	Vaggeryd	Residential	Multi-family housing with 16 units at Liljedal, based on Kombo housing concept developed by SABO.	(M)	2016	100%	100%	30	30	Expected	35	5
63 New Buildings	Finspångs kommun (Finspång municipality)	Finspång	Residential	Multi-family housing unit with 32 apartments (Majoren).	(M)	2017	100%	93%	70	65	Expected	64	8
67 New Buildings	Kalmarhem AB (Kalmar Municipal Housing Company AB)	Kalmar	Residential	Multi-family housing with 31 units at Vallmon, based on Kombo housing concept developed by SABO.	(M)	2016	93%	0%	30	0	Expected	0	0
76 New Buildings	Kopparstaden AB (Falun Municipal Housing Company AB)	Falun	Residential	Construction of Vitsippan multi-family housing unit, certification according to Feby 12 (passiv house)	(M)	2012	100%	100%	100	100	Actual	151	19

* (A)=Adaptation, (M)=Mitigation, (E)=Environmental Management
** Value represents Kommuninvest's share of the total energy savings, based on disbursed amounts
*** Based on the share financed by Kommuninvest (disbursed amounts)

Green buildings and energy efficiency #	Sub-category	Borrower	Project location	Type of building	Project description	(A), (M) or (E) *	Project Completion	KI Share of Financing	Disbursed /Total	Committed Amount	Disbursed Amount	Expected or Actual impact	Annual energy savings **	GHG-emissions reduced / avoided ***
							Year	*%*	*%*	*MSEK*	*MSEK*		*MWh*	*Tonnes of CO2e/year*
3	New Buildings	Järfälla municipality	Järfälla	Non-residential	Herresta School in Barkarby district	(M)	2016	92%	87%	317	300	Expected	429	26
6	New Buildings	Ärehus AB	Åre	Non-residential	New nursery school in Undersåker	(M)	2018	83%	75%	44	40	Expected	11	4
9	Energy Efficiency	Trollhättans Tomt AB (Trollhättan Ground Plot Company)	Trollhättan	Non-residential	Energy efficiency measures in two municipal properties	(M)	2014	73%	73%	5	5	Actual	87	9
10	New Buildings	Trollhättans Tomt AB (Trollhättan Ground Plot Company)	Trollhättan	Non-residential	Construction of new nursery school	(M)	2017	75%	75%	43	43	Expected	44	17
15	New Buildings	Kommunfastigheter i Knivsta AB (Knivsta Municipal Property Company)	Knivsta	Non-residential	Construction of the new Högås school (Sweden's first school built as a passive house)	(M)	2015	100%	92%	164	150	Expected	219	41
17	New Buildings	Umeå municipality	Umeå	Non-residential	New nursery schools (Solbacken, Morgonstjärnan & Hedlunda) and new schools (Flurkmark & Storsjö)	(M)	2015	100%	100%	300	300	Actual	1 224	251
18	New Buildings	Umeå municipality	Umå	Non-residential	Dedicated buildings for public admistration, care and sports	(M)	2014	100%	100%	268	268	Actual	929	146
28	New Buildings	Växjö Kommunföretag AB (Växjö Municipal Company AB)	Växjö	Non-residential	Vikaholm nursery school for 160 children, first municipal building in Växjö to obtain environmental certification (Miljöbyggnad Silver).	(M)	2014	100%	100%	50	50	Expected	114	7
29	New Buildings	Växjö Kommunföretag AB (Växjö Municipal Company AB)	Växjö	Non-residential	Pär Lagerqvist school in Växjö for 1,000 students. Highest environmental certification (Miljöbyggnad Gold). >25% of the structure in massive wood.	(M)	2017	100%	81%	310	250	Expected	454	51
31	New Buildings	Landstinget i Värmland (Värmland County Council)	Karlstad	Non-residential	New operations facility at the main hospital in Karlstad. Environmental certification according to LEED Gold.	(M)	2016	70%	59%	1 050	880	Expected	93	22
32	New Buildings	Landstinget i Värmland (Värmland County Council)	Karlstad	Non-residential	New buildings at the main hospital in Karlstad. Environmental certification according to EU Green Building.	(M)	2011	94%	93%	724	720	Actual	1 142	144
36	New Buildings	Trollhättans Tomt AB (Trollhättan Ground Plot Company)	Trollhättan	Non-residential	New office building, certification according to Miljöbyggnad (Environmental Building) Silver	(M)	2017	83%	83%	55	55	Expected	36	4
41	New Buildings	Älmhult municipality	Älmhult	Non-residential	New Elme School for 800 students, built as a passive house.	(M)	2017	100%	79%	215	170	Expected	477	181
43	New Buildings	AB Sjöbohem (Sjöbo Municipal Housing Company AB)	Sjöbo	Non-residential	New energy-efficient swimming facility. Environmental certification according to Miljöbyggnad Silver.	(M)	2016	100%	79%	151	120	Expected	122	12
48	New Buildings	Skara municipality	Skara	Non-residential	New Viktoria high school. Environmental certification according to Miljöbyggnad Silver.	(M)	2017	100%	89%	338	300	Expected	506	62
71	New Buildings	Skövde Municipality	Skövde	Non-residential	Billing school (phase 1), certification according to Miljöbyggnad (Environmental Building) Gold	(M)	2014	100%	100%	130	130	Actual	163	20
72	New Buildings	Skövde Municipality	Skövde	Non-residential	Billing school (phase 2), certification according to Miljöbyggnad (Environmental Building) Gold	(M)	2018	100%	100%	85	85	Expected	96	12
73	New Buildings	Skövde Municipality	Skövde	Non-residential	Construction of Bissgården pre-school	(M)	2016	100%	100%	30	30	Expected	24	9
74	New Buildings	Skövde Municipality	Skövde	Non-residential	Construction of Claesborg pre-school	(M)	2014	100%	87%	30	26	Actual	45	6
75	New Buildings	Skövde Municipality	Skövde	Non-residential	Construction of Tidan pre-school	(M)	2017	100%	100%	30	30	Expected	34	6
77	Energy Efficiency	Ludvika Municipality	Ludvika	Non-residential	Energy efficiency measures in multiple municipal properties.	(M)	2008	39%	0%	39	0	Actual	0	0
79	New Buildings	Ale Municipality	Ale	Non-residential	Ale school, built with passive house technology	(M)	2017	81%	81%	180	180	Expected	506	48
80	New Buildings	Mariestad Municipality	Mariestad	Non-residential	Prisma and Unica schools, certification according to Miljöbyggnad (Environmental Building) Silver	(M)	2017	100%	71%	250	179	Expected	428	56
Subtotal for Green buildings and energy efficiency								**90%**	**82%**	**6 604**	**6 007**		**14 781**	**2 018**

* (A)=Adaptation, (M)=Mitigation, (E)=Environmental Management
** Value represents Kommuninvest's share of the total energy savings, based on disbursed amounts
*** Based on the share financed by Kommuninvest (disbursed amounts)

Energy efficiency

#	Borrower	Project location	Project description	(A), (M) or (E) *	Project Completion	KI Share of Financing	Committed Amount	Disbursed Amount **	Expected or Actual impact	GHG-emissions reduced / avoided ***
					Year	*%*	*MSEK*	*MSEK*		*Tonnes of CO2e/year*
44	Falu Energi & Vatten AB (Falun Energy & Water AB)	Falun	Linking together the district heating networks of Falun and Borlänge through a pipeline.	(M)	2015	50%	64	70 **	Expected	1 322
66	Skellefteå Stadshus (Skellefteå Municipality)	Skellefteå	Flue gas condensation investment at the Hedensbyn bioenergy production plant.	(M)	2016	82%	71	71	Expected	17 527
82	Köping Municipality	Köping	Connecting the Köping and Arboga district heating grids and increasing the use of surplus heat	(M)	2017	30%	100	100	Expected	2 662
Subtotal for Energy efficiency						**43%**	**235**	**241**		**21 511**

* (A)=Adaptation, (M)=Mitigation, (E)=Environmental Management

** Mismatch between committed and disbursed amounts due to joint financing of projects 44, 45 and 46. Total commitments for these three projects exceed disbursements. To be corrected second half of 2017.

*** Based on the share financed by Kommuninvest (disbursed amounts)

Public transportation

#	Borrower	Project location	Project description	(A), (M) or (E) *	Project Completion	KI Share of Financing	Committed Amount	Disbursed Amount	Expected or Actual impact	GHG-emissions reduced / avoided **	Other indicators
					Year	*%*	*MSEK*	*MSEK*		*Tonnes of CO2e/year*	
8	Trelleborg municipality	Trelleborg	Co-financing for regional train network Trelleborg-Malmö	(M)	2011	85%	241	240	Expected	442	Reduced car travel: 6 million km/year; in 2016, increased use of public transport between Trelleborg-Malmö by 18% vs 2015.
16	Umeå municipality	Umeå	Electric buses for local transport.	(M)	2014	100%	76	76	Expected	n/a	Reduced energy use 2 MWh/year, increased use of public transport by 5% or 5,000 trips per year.
58	Kifab i Kalmar AB (Kalmar Municipal Industrial Property Company AB)	Kalmar	Railway maintenance depot in Kalmar.	(M)	2017	95%	100	100	Expected	290	
Subtotal for Public transportation						**90%**	**417**	**416**		**732**	

* (A)=Adaptation, (M)=Mitigation, (E)=Environmental Management

** Based on the share financed by Kommuninvest (disbursed amounts)

Waste management

#	Borrower	Project location	Project description	(A), (M) or (E) *	Project Completion	KI Share of Financing	Committed Amount	Disbursed Amount	Expected or Actual impact	GHG-emissions reduced / avoided **	Other indicators
					Year	*%*	*MSEK*	*MSEK*		*Tonnes of CO2e/year*	
60	Halmstads kommun (Halmstad municipality)	Halmstad	Optical waste sorting facility at Kristinehed, targeting household waste and up to six fractions. Approval for 75,000 tonnes capacity.	(M)	2017	100%	125	125	Expected	500	Sorting of food waste and other organic waste to result in increased production of biogas and biofertiliser.
Subtotal for Waste management						**100%**	**125**	**125**		**500**	

* (A)=Adaptation, (M)=Mitigation, (E)=Environmental Management
** Based on the share financed by Kommuninvest (disbursed amounts)

Water management

#	Borrower	Project location	Project description	(A), (M) or (E) *	Project Completion	KI Share of Financing	Committed Amount	Disbursed Amount	Expected or Actual impact	GHG-emissions reduced / avoided **	Other indicators
					Year		*MSEK*	*MSEK*		*Tonnes of CO2e/year*	
11	Karlskoga Energi & Miljö AB (Karlskoga Energy & Environment Company)	Karlskoga	Upgrading of wastewater treatment facility to comply with EU requirements regarding nitrogen purification.	(E)	2015	90%	35	35	Expected	n/a	Nitrogen reduction from 19 mg/l to 10 mg/l. Ammoniacal nitrogen from 15 mg/l to 4 mg/l.
30	Falu Energi & Vatten AB (Falun Energy & Water AB)	Falun	New drinking water source for 110,000 people in Falun and Borlänge municipalities, replacing the current surface water source with ground water.	(M), (E)	2015	100%	217	200	Expected	n/a	900 tonnes of chemicals to be phased out from water preparation. Reduction in CO2 emissions from transports.
55	Borås Stad (Borås Municipality)	Borås	Sobacken - new wastewater treatment plant	(M), (E)	2019	81%	1 100	0	Expected	n/a	Expected to meet pollution requirements of BOD (Biochemical Oxygen Demand) 8 mg/l; nitrogen 8 mg/l; phosphorus 0.2 mg/l.
57	Syvab (Southwest Stockholm Wastewater Treatment Company, Södertälje Municipality)	Botkyrka	Upgrading of Himmerfjärden wastewater treatment plan	(M), (E)	2009	19%	268	268	Expected	n/a	Reduced nitrogen emissions from 10 mg/l to 8 mg/l. Phosphorus from 0.5 mg/l to 0.4 mg/l. Increased biogas production.
69	Rättviks Teknik AB (Rättvik Municipal Technical Comp. AB)	Rättvik	Upgrading and expansion of Rättvik wastewater treatment facility	(M)	2018	100%	85	85	Expected	n/a	Reduction of BOD from 8 mg/l to 4 mg/l, phosphorus from 0.5 mg/l to 0.2 mg/l. Increase in population equivalent from 8,000 to 25,000.
70	Leksands Vatten AB (Leksand Municipal Water Company AB)	Leksand	Upgrading and expansion of Leksand wastewater treatment facility	(M)	2019	100%	115	48	Expected	n/a	Reduction of BOD from 11 mg/l to 4 mg/l, phosphorus from 0.2 mg/l to 0.1 mg/l. Increase in population equivalent from 13,000 to 19,000.
Subtotal for Water management						**57%**	**1 820**	**635**			

* (A)=Adaptation, (M)=Mitigation, (E)=Environmental Management
** Based on the share financed by Kommuninvest (disbursed amounts)

APPENDIX

Calculation of climate impact

Introduction

As of 31 December 2016, Kommuninvest had financed Eligible Projects in six out of eight categories: Renewable energy; Energy efficiency in energy systems; Green buildings and energy efficiency; Public transportation; Waste management; and Water management.

Investments in these categories lead to direct reductions in greenhouse gas emissions, primarily through energy savings, or reduce energy consumption and thereby indirectly reduce greenhouse gas emissions.

The environmental impact of Eligible Projects is calculated using actual or estimated annual impact, compared to an alternative base scenario where the investment has not taken place or where it has been completed solely meeting regulatory requirements.

The impact of reduction in greenhouse gas emissions is measured in CO_2-equivalents (CO_2e) while energy savings are measured in MWh. Other units of measurements may be used when appropriate. All project climate impact calculations are based on the share of financing provided by Kommuninvest and the actual disbursements to the project.

We report the impact of investments on an ex-ante basis, i.e. on the basis of estimates. If we have access to ex-post data, i.e. actual outcomes, we will report on these. The project-by-project disclosures indicate whether impact is reported based on estimates or actual outcomes.

Joule conversion

In this report we use watt-hours as the energy unit, with 1 Wh being the equivalent of one watt of power expended for one hour of time. See below for a Joule (J) conversion factor.
1 Wh = 3.6 kJ; 1kWh = 3.6 MJ, 1 MWh = 3.6 GJ

Definitions used in this document	
A_{temp}	All internal area of a building which is heated to more than 10 °C in sq.m. Atemp is the area which energy consumption in Sweden is calculated.
CO_2e	Carbon dioxide equivalent
kWh, MWh and GWh	Kilowatthour, Megawatthour and Gigawatthour
PE	Population equivalent

13 Table: IPCC Fourth Assessment Report: Climate Change 2007

Baselines for CO_2 emissions

The baseline emission factors (used to calculate emissions for alternative scenario) and project emission factors (used to calculate emissions from actual projects) are presented on the next page. Below, the considerations for electricity and district heating project are outlined.

Electricity

The highly interconnected regional electricity market is the cornerstone of the Nordic energy system, and it can serve as a key enabler for further emissions reductions in the decades ahead. It can also be expected that European energy markets will be increasingly interconnected, with energy traded cross-border to an increasing degree.

Kommuninvest has chosen a mainland European mix, including 26 European Union countries as well as Norway, as the relevant baseline for electricity. The rationale is that a non-negligible interconnection and export surplus from the Nordic countries to European energy markets exist already today and is planned to increase in the coming decades.

In line with IFI recommendations[14], we apply a Combined Margin (CM) for the grid that is comprised of an Operating Margin (OM) and a Build Margin (BM). However, for simplicity and relevance to the Swedish context, Kommuninvest applies a CM of 50% OM and 50% BM for all relevant projects, as opposed to the IFIs which apply different combinations of the OM and BM depending on the type of project financed. This also means adopting a more conservative approach than if the IFI methodology had been applied. The CM used in this report is 380 kg CO_2e per MWh.

District heating

In the Nordic countries, district heating[15] has successfully enabled the transition from fossil fuel based heating systems to heating systems based primarily on renewable energy sources. Remaining fossil fuel use is today being gradually substituted and phased out.

The systems of district heating (and district cooling) are fundamentally local/regional and not interconnected on a national or Nordic basis. Kommuninvest has commissioned an external advisor (Profu) to develop a baseline emission factor for district heating for Sweden, based on avoided mix of alternative heating technologies. This estimated baseline figure for district heating in Sweden amounts to 117 kg/MWh, representing an avoided alternative heating mix of 20% wood pellet boilers, 45% geothermal heat pumps, 28% air/water heat pumps and 7% air to air heat pumps.

Readers are advised that this figure represents a national average for what are essentially locally based energy systems, in order to facilitate calculations. Using national averages is feasible for most investment projects financed by Kommuninvest, but local circumstances and actual changes in production mix are considered for certain projects related to increased interconnection, energy efficiency and other changes in the production mix.

For the calculation of impact, Kommuninvest compares baseline emissions with actual or expected project emissions. For district heating projects in the renewable energy category, Kommuninvest calculates project emissions based on the national average emission factor for district heating in Sweden. An additional environmental benefit of 41 kg/MWh, as a national average, is ascribed due to avoided alternative waste treatment (land fill and methane leakage).

For district heating projects in the energy efficiency category, Kommuninvest calculates project emissions based on local emissions. No additional benefit for avoided alternative waste treatment is added.

[14] International Financial Institution (IFI) Framework for a Harmonized Approach to Greenhouse Gas Accounting, November 2015.

[15] District heating is a system for distributing heat generated in a centralized location for residential and commercial heating requirements. In Sweden, the heat is often obtained from a cogeneration plant burning principally renewable energy sources, including biomass, but plants also use waste and excess heat, and to a minor extent, fossil fuels. District heating plants may also be used to produce electricity (combined power and heating plants, CHP), and cooling.

Baseline emission factors (used to calculate alternative emissions scenario), Scope 1 and 2

Type	Emission factor	Comment
Variable electricity generation, e.g. wind and solar power projects	380 kg CO_2e/MWh	EU 26 (mainland) plus Norway, average 2011-2013: Combined Margin (50% Operating Margin (OM) 483 kg CO_2e/MWh + 50% Build Margin (BM) 277 kg CO_2e/MWh)[1]
Firm electricity generation e.g. hydropower projects	380 kg CO_2e/MWh	See above
Electricity consumption from the grid, e.g. green buildings and energy efficiency projects	380 kg CO_2e/MWh	See above
Electricity generation in district heating projects	380 kg CO_2e/MWh	See above
Heat consumption from the grid, e.g. green building and energy efficiency projects	59 kg CO_2e/MWh	Swedish average for heating production from district heating[2]
Heat generation in district heating projects	117 kg CO_2e/MWh	Estimated national Swedish average for avoided alternative heating[3]
Waste incineration in district heating projects	41 kg CO_2e/MWh	Estimated national Swedish average for avoided alternative waste treatment[4]
Biogas generation projects	225 kg CO_2e/MWh	Swedish average (diesel)[5]

1 Calculation by Kommuninvest, based on IFI Interim Dataset of Harmonized Grid Factors v 1.0, as provided by Nordic Investment Bank
2 Swedenergy
3 Profu
4 Swedenergy (calculations by Profu)
5 Swedish Environmental Agency

Project emission factors (used to calculate actual project emissions), Scope 1 and 2

Type	Emission factor	Comment
Variable electricity generation, e.g. wind and solar power projects	0 kg CO_2e/MWh	-
Firm electricity generation, e.g. hydropower projects	0 kg CO_2e/MWh	-
Electricity generation in district heating projects	97 kg CO_2e/MWh	Swedish average for electricity production from district heating[1]
Heating generation in district heating projects	58,6 kg CO_2e/MWh	Swedish average for electricity production from district heating[1]
Biogas generation projects	0 kg CO_2e/MWh	-

1 Swedenergy

Renewable energy | Collected data and Climate impact calculation

Eligible Projects in the Renewable energy category exploit or intend to exploit various types of renewable energy sources, in order to expand capacity or replace or offset existing or planned fossil fuel-based energy production and supply.

Renewable energy sources that can be approved for Kommuninvest financing include solar and wind power, geothermal energy, bioenergy, bioenergy and biogas from waste, as well as small-scale hydro power. Eligible Projects may not supply energy with more than 10 percent fossil fuel content.

The table below outlines the data input collected from Eligible Projects as well as the methodology applied when calculating the environmental impact.

Sub-category	Collected data	Climate impact calculation
Bioenergy	• Annual production of bioenergy (biodiesel, bioethanol, biogas, CNG[16] and other biofuels), measured in MWh. • Annual delivery of specific bioenergy measured in MWh.	*Annual climate impact (CO_2e) =* *Annual production of renewable energy in MWh * baseline emissions factor - Annual production of renewable energy (MWh)* project emission factor* *Note: Different baseline emission factors and project emission factors are applied to different sub-categories. These are presented on page 19.*
Wind, wave, solar and geothermal	• Installed capacity, in MW. • Estimated annual production of electricity, in MWh.	*See above*
District heating	• Estimated or actual annual output of heating and electricity, in MWh.	*See above*

[16] Compressed Natural Gas *(Sw:"fordonsgas")* from bioenergy plants

Green buildings | Collected data and Climate impact calculation

Eligible Projects in this category are intended to reduce energy usage in new or existing buildings, resulting in a reduction in net external energy demand and a reduction in CO_2 emissions.

Impact is reported in relation to the building regulation in force upon launch of the Kommuninvest Green Bonds Framework (BBR 21). The regulation has since been revised and the regulation in force upon publication of this document is BBR 24.

Sub-category	Collected data	Climate impact calculation
New buildings	• Heated surface area in square metres (A_{temp}). • Estimated annual heating consumption of the building, measured in kWh/A_{temp} in accordance with applicable Swedish regulations . • Estimated annual electricity consumption of the building, measured in kWh/A_{temp}. • Required maximum energy consumption of the building, measured in kWh/A_{temp}. • Annual production of installed solar panels, measured in kWh/A_{temp}.	*Annual climate impact (CO_2e) =* *((Heat consumption of reference building in MWh * baseline emissions factor for heat consumption + electricity consumption of reference building in MWh * baseline emissions factor for electricity consumption) - (Heat consumption of project building in MWh * baseline emissions factor for heat consumption + electricity consumption of the project building in MWh * baseline emissions factor for electricity consumption))* *Note: The relationship between heat and electricity consumption of the reference building may differ from the project building.*
Energy efficiency	• Heated surface area square metres (A_{temp}), • Annual energy use before the investment, in kWh per sq.m. • Annual energy use after the investment, in kWh per sq.m.	*Annual climate impact (CO_2e) =* *((Heat consumption of building pre investment in MWh * baseline emissions factor for heat consumption + Electricity consumption of building pre investment in MWh * baseline emissions factor for electricity consumption) - (Heat consumption of building post investment in MWh * baseline emissions factor for heat consumption + electricity consumption of building post investment in MWh * baseline emissions factor for electricity consumption)* *Note: The relationship between heat and electricity consumption of the building pre investment may differ from that of the building post investment.*

17 *Swedish: "BEN - Boverkets föreskrifter och allmänna råd om fastställande av byggnadens energianvändning", "BBR – Boverkets Byggregler".*

Energy efficiency in energy systems | Collected data and Climate impact calculation

Eligible Projects in this category are intended to improve energy efficiency in predominantly fossil-free energy systems, resulting in either a reduction in energy use or the increased delivery of energy to end users. As of 31 December 2016, all Eligible Projects in this project category were related to District heating systems.

Sub-category	Collected data	Climate impact calculation
District heating systems	See Renewable energy	*See Renewable energy*

Other project categories | Collected data[18] and Climate impact calculation

For project categories outlined below, no generally applicable calculation model is used, Kommuninvest relies on reported data from projects. More elaborate impact analysis is possible to undertake in relation to these projects, and we aim to develop our reporting in the future. The choice of indicators can also be expected to undergo revision as more knowledge is gathered and best practices are developed.

Public transportation

Eligible Projects are intended to increase transportation of goods and passengers while consuming a minimal or zero amount of fossil fuels, resulting in a reduction of greenhouse gas emissions.

Collected data

- # of people the project will affect each year.
- An estimate of the number of cars/road kilometres the project will replace.
- If feasible: Annual energy savings, reduction in greenhouse gas emissions and/or local emissions, or amount of greenhouse gas emissions and/or local emissions that will be avoided as a result of the investment.

Waste management

Eligible Projects are intended to either increase recycled waste capacity, improve energy efficiency, reduce the amount of release of harmful substances or meet other appropriate conditions set by Kommuninvest.

Collected data

- Number of tonnes of waste expected to be processed by the facility each year.
- An estimate of the reduction in greenhouse gas emissions/the amount of greenhouse gas emissions that will be avoided as a result of the investment, in tonnes of CO_2e.
- If feasible: Estimate annual energy savings attributable to the investment, in kWh.
- Expected improvement in material recovery rate or other target for improved resource use.
- For biogas plants: Expected annual production volume.

Water management

Eligible Projects are intended to reduce leakage or improve filtration of harmful substances in the water purification process, increase output measured in person equivalents (PE) or meet other appropriate conditions set by Kommuninvest.

Collected data

- Number of metres of piping/conduit laid, upgraded or replaced.
- Number of person equivalents (PE) of water or wastewater the plant processes, identifying any increase that can be attributed to the investment.
- Qualitative indicators/targets for adaptation to climate change (managing urban runoff etc.), with a description of weather-related or climate-related problems that will be mitigated by the investment.
- Where relevant, amount of electricity, biogas or other energy carrier expected to be produced each year.

Adaptation measures

This category is dedicated towards adaptation measures to new environmental conditions, due to inter alia anticipated increasing rainfall, rising sea levels, or increased drought. Projects deemed eligible on a case by case basis. Relevant indicators are dependent on the characteristics of the project, and determined by Kommuninvest in consultation with the borrower. No project applications by 31 December 2016.

Environmental management

Eligible Projects are intended to promote sustainable environment development in areas other than climate change. Measures include preserving biodiversity, sustainable agriculture and improvement of eco-systems. Projects are deemed eligible on a case by case basis. Relevant indicators are dependent on the characteristics of the project, and determined by Kommuninvest in consultation with the borrower. No project applications by 31 December 2016.

18 *Collected data represents the information that Kommuninvest asks borrowers to provide in Green Loan applications and annual follow-up reporting. Not all projects have provided all of the information indicated in this section.*