



GREEN BONDS

Within its environmental programme, the City of Gothenburg issues bonds to finance environmental projects in renewable energy, public transport, water, energy efficiency, smart grids, urban planning and waste management. In 2014, the city has issued its second green bond of 1.81 billion SEK, compared to 500 million in the very first issue. The interest from the market has been large and green bonds as a phenomenon continue to grow. The aggregated outstanding green bonds issued by the city sum to 2.31 billion SEK.

Eligible projects may include projects aimed at:

(A) the mitigation of climate change, including investments in low-carbon and clean technologies, such as energy efficiency and renewable energy sources and projects ("Mitigation Projects")

(B) adaptation to climate change, including investments in climate robust growth ("Adaptation Project"), or

(C) projects related to a sustainable environment instead of direct climate-related (maximum 20%).

Division of green bond proceeds, mln SEK			
Project	2013	2014	2015 ¹
Ultrafilter	150	420	100
GOBIGAS	300	0	620
Electric cars	30	18.6	-
Denitrification		47	123
Tree planting		8.3	
Celsius district heating		5	
Sustainable housing		382	418
Sum/year	480	881.37	1261
Total	480	1361.37	2622.37

Projects funded by green bonds

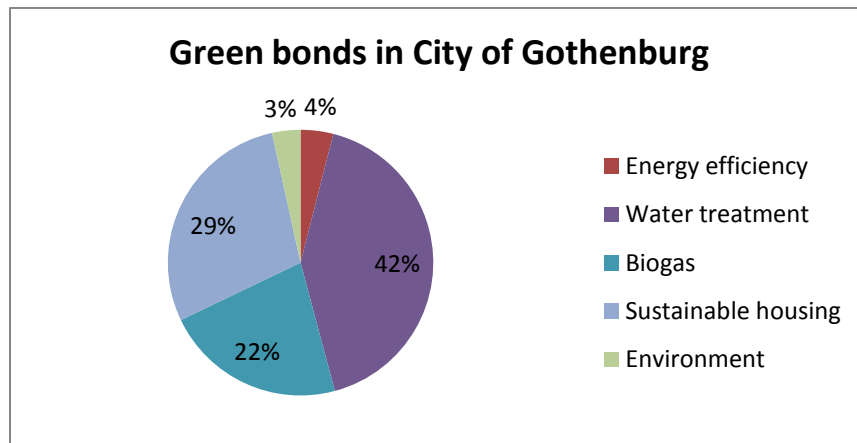
Previously, the city has chosen to fund

- Lackarebäck water plant and purification filter
- GoBiGas and
- Gatubolaget electric cars.

In 2014, more green projects have been added to portfolio, in addition to continued investments in existing projects, among others:

- Gryaab denitrification project
- Park & naturförvaltningen tree planting
- Göteborg Energi Celsius Project
- Lokalförvaltningen – projects in sustainable housing

You can read more about the projects and their environmental impact on the city's website for financial information, <http://finans.goteborg.se>



¹ Estimates for 2015.



Lokalförvaltningen – projects in sustainable housing

We build only low-energy when we build new buildings

A new building in Lokalförvaltningen auspices should only use a maximum of 45 kWh / year of energy for heating, hot water and building operations. This is about 60% lower than required in the national building regulations and is in line with passive house standard. In addition, we make very high demands on the energy performance of the components that affect the company’s energy consumption, such as energy saving light with smart control, energy-efficient appliances.



We put very high standards on materials use

We assume that children are more sensitive to exposure to hazardous materials. Therefore, we avoid such endocrine disruptors. Durability over time is a key word. Several projects have green roofs, known as sedum roofs to increase biodiversity, add more green in the urban environment, reduce stormwater flows, creating better microclimate and promote noise reduction.

Göteborg Energi AB – investments in district heating

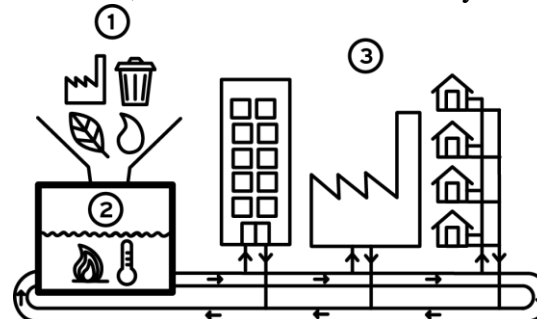
Celsius – district heating for boats

In Celsius, the city has a “lead” position and Göteborg Energi AB project manages the various European cities participating in the project. Purpose is to show how the district heating and cooling can be used in particular to utilize waste heat in a city and maximize energy efficiency. EU demands this kind of solutions to achieve the 20 percent energy efficiency by 2020.

A measure implemented by Celsius project is to heat a large ferry with district heating when it is docked. Göteborg Energi’s district heating system supplies the Stena Danica with hot water by a new heat exchanger. Gothenburg and Stena Line are the first in the world with this. Since earlier the ferry is also connected to the land electricity network. This saves emissions of 500 tons of carbon dioxide per year.

Celsius – district heating for domestic appliances

Instead of heating water in a washing machine or air in a dryer with electricity, a use can be made of district heating. Using district heating, it is possible to replace up to 80% of electricity demand and reduce the power requirement of electricity by up to 90%. With district heating, the heat comes from the heat exchanger to the machines, instead from of electricity.





Gryaab – Denitrification

In order to fulfill Sweden's commitments under the Baltic Sea Action Plan and to meet future population growths, Gryaab estimates that it is necessary to increase nitrogen retention further. Gryaab has decided to invest SEK 360 million on an expansion of existing denitrification facilities. The new plant is expected to be taken into use in 2016. The nutrient nitrogen is of great importance for the eutrophication of the North Sea.

Gryaab nitrogen removal is done in two steps. In the first step transforms bacteria ammonium into nitrate and in the other nitrate to nitrogen gas. The nitrogen then ends up in the air rather than to fatten the sea. The new extension will increase capacity in the first stage. A reactor with so-called mobile carriers will be built. The carriers are plastic pieces which bacteria adhere and grow into. The use of mobile carriers is an effective way to purify water in a small space. Prior to the decision, consultations with Gryaab seven owner municipalities were conducted. All municipalities were in favor of the investment.

GoBiGas

GoBiGas project aims to gasify wood raw material for the production of biogas that will be distributed at existing gas grid. The project is divided into two stages with a demonstration plant as the first stage and then a commercial facility that second stage. The first phase is designed to produce 160 GWh / year, equivalent to fuel to about 16 000 cars in years, and the second phase is scheduled to produce 640 to 800 GWh / year. The project is run in close collaboration with both academia (Chalmers) and suppliers (Valmet on Lundbystrand, Gothenburg). For GoBiGas project's first phase started excavation work in 2011 and installation in 2012. The facility is now completed and commissioning is underway. In 2014, the plan is to get the demonstration plant in continuous operation for evaluating technology choices, function and performance. In parallel with the execution, a major focus was placed on participation in various fora to improve the economic conditions for the production of biogas.





City of Gothenburg builds the largest ultra filter plant in Scandinavia

Waterborne infection is one of the greatest threats to our drinking water. To ensure a good quality and healthy water, the City of Gothenburg installs ultra filters, and builds out the capacity at the water plant in Lackarebäck at a cost of 700 million.

"We know that future climate change, which means increased rainfall and increased levels of seas and rivers, can increase the levels of bacteria, viruses and parasites in our waterways," said Claes Wångsell, director of the drinking water production. If the raw water quality is to deteriorate, we must rehabilitate our water utilities to ensure high quality of drinking water. As microbiological barrier, we have chosen to invest in an ultra filtration plant, which when completed at the turn of 2015/2016, will be largest in the Nordic region.

The focus on ultra filter is part of the work that Kretslopp och vatten committee does to ensure continuous supply of highest quality drinking water. Ultra filter is a further step in the current drinking water preparation.

The investment of SEK 700 million in ultra filter plant in Lackarebäck is a priority project for the City of Gothenburg and is supported by the City Council. The investment is easy to account for in case of a disease outbreak, similar to those that occurred elsewhere in Sweden and the rest of the world.

We are currently (in late Feb / Mar 2015) in the midst of the exciting commissioning of Phase 1 of the membrane plant. Parallel with the completion of Stage 2 and the end of 2015, we expect to produce all outgoing drinking water from Lackarebäck's waterworks through ultra filter barrier - and thus gain a powerful increase in security against waterborne pathogens.

More about the projects:

- ❖ [Gobigas](#) - Göteborg Energi
- ❖ [Lokalförvaltningen](#) – City of Gothenburg
- ❖ [Celsius project](#) – Göteborg Energi
- ❖ [Denitrification](#) – Gryaab
- ❖ Ultra filter([video 1](#)) – Kretslopp och vatten committee
- ❖ Ultra filter([video 2](#)) – Kretslopp och vatten committee