FUTURE BUILT

Climate Friendly Architecture and Urbanism

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CONTENT

Cover photo: Jens Fremming Anderssen

RE

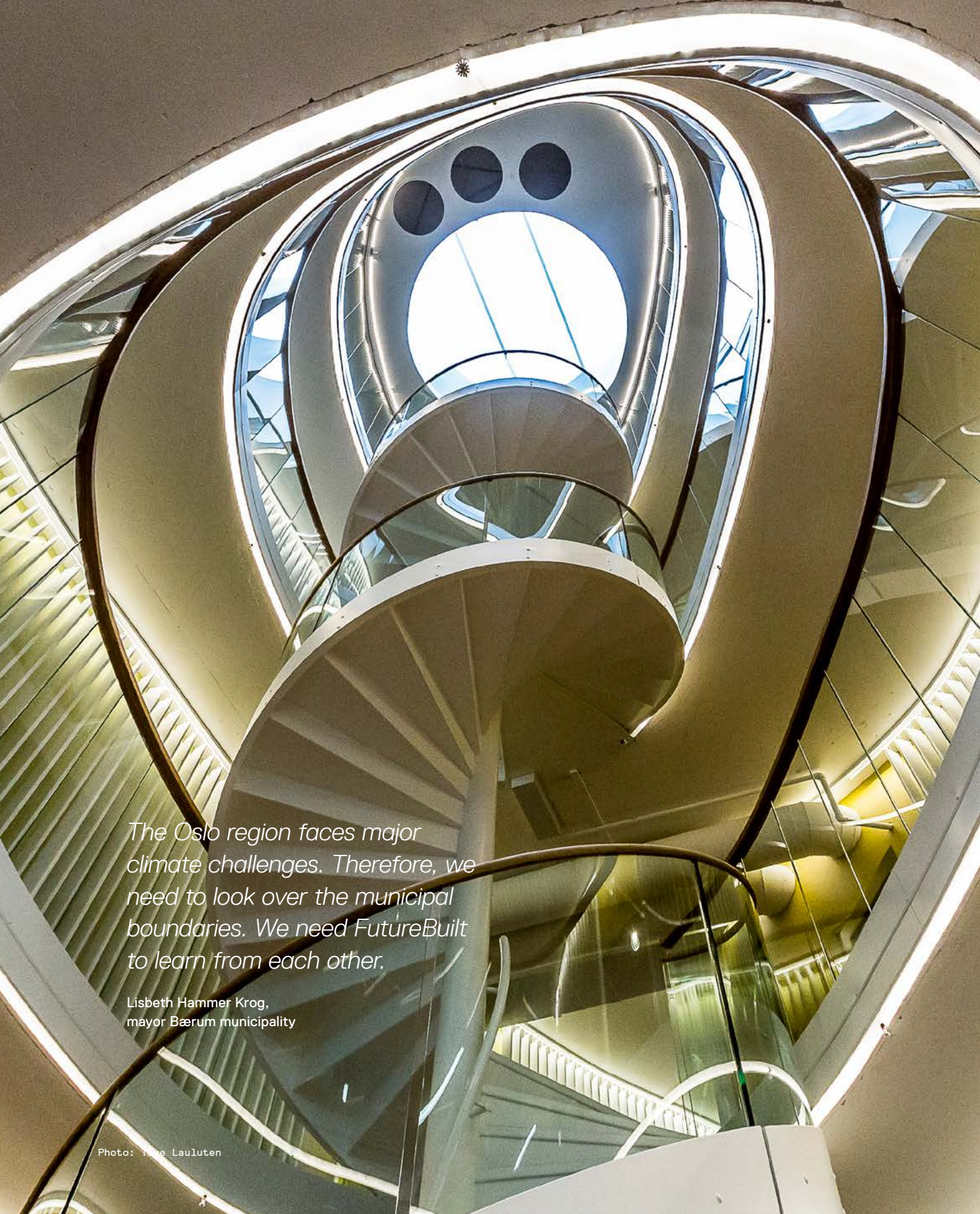
Climate-friendly Architecture and Urbanism

Man-made climate change is one of the main challenges of our time. Our greenhouse gas emissions must be reduced drastically, and this will in turn have important consequences for urban planning and architecture. It is anticipated there will be a 30 per cent increase in the population living in cities by 2030. As the economic growth is mainly connected to cities these will have an important role in fighting climate change.

The Oslo region is the largest urban area in Norway. The region is rapidly expanding, with an estimated population growth of 40 per cent in the next 30 years. This necessitates the development of new housing, workplaces and transport infrastructure.

FutureBuilt is established to support climate-friendly urban development in the Oslo region. FutureBuilt is a ten-year programme with the aim of developing at least 50 pilot projects involving climate-friendly buildings and city areas. FutureBuilt will run until 2020, and the pilot projects will be completed throughout this period.

The programme is a collaboration between ten partners: the municipal authorities of Oslo, Bærum, Asker and Drammen, the Ministry of Local Government and Modernisation, the Norwegian State Housing Bank, Enova, the Agency for Building Regulations, Green Building Alliance and the National Association of Norwegian Architects.



The Oslo region faces major climate challenges. Therefore, we need to look over the municipal boundaries. We need FutureBuilt to learn from each other.

Lisbeth Hammer Krog,
mayor Bærum municipality

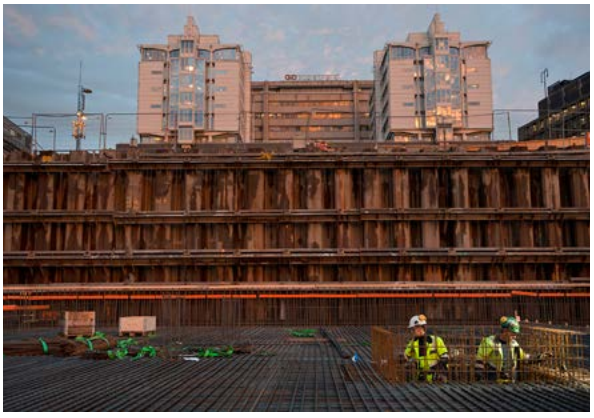
Photo: Tore Lauluten

The Power of Good Examples

VISION

FutureBuilt's vision is to show that climate neutral buildings and urban areas based on high quality architecture are possible.

There is great power in a good example, and that is why FutureBuilt uses pilot projects as a strategy for changing the way we are developing our buildings and city areas. The pilot projects are meant to inspire and change practices in both the private and the public sector.



Photos: Paulina Cervenka, Ken Opprann/Statsbygg

QUALITY CRITERIA

There are specific criteria for being a FutureBuilt pilot project. The carbon footprint must be reduced by at least 50 per cent compared to today´s regulations and common practice. This is measured by a climate gas accounting tool for buildings. The projects must:

- reduce greenhouse gas emissions from transport, energy and materials and be located near major transport hubs
- be of high urban and architectural quality
- be innovative and have showcase qualities

URBAN ENVIRONMENT AND ARCHITECTURE

Quality architecture in interplay with its surroundings will add value to the city. FutureBuilt pilot projects will benefit residents, users and the urban population at large. The pilot projects must be of high architectural quality, especially with respect to the outdoor spaces and their relationship to the city environment. This means qualities such as walkability, cyclability, safety and comfort, meeting places and experiences, relation to the city structure, universal design, water, biodiversity, etc. The projects are expected to include extra qualities over and above the minimum demanded by planning authorities.

INNOVATION

FutureBuilt contributes to the green shift in the building trade. All the pilot projects must outline a set of ideal qualities and illustrate how the projects contribute to innovation and new thinking. These can be new environmental standards such as plus-energy housing, new products, concepts and processes.

FutureBuilt's projects contribute to more climate-friendly solutions than those required by the planning regulations.

Hanna Marcussen,
city councillor for urban development,
Oslo municipality

TRANSPORT
The FutureBuilt pilot projects are to be located in the urban centres or close to public transport hubs. Green mobility requires fewer motorists and more pedestrians, cyclists and people who use public transport. The amount of parking spaces shall be halved, at least. Facilities for pedestrians and cyclists shall be of high quality.

ENERGY
The technology around energy efficiency and local, renewable power is advancing rapidly. Passive houses represented the limit of energy efficiency only a few years ago. Now the first plus-energy houses have been realised, buildings that actually produce more energy than they consume. For the pilot projects, the energy for operation of the building must as a minimum be based on forthcoming regulations, which means close to net-zero energy. Plus-energy buildings are especially interesting. This requires the possibility of selling excess power and heat. FutureBuilt seeks to be a driving force for such development by challenging suppliers as well as the existing legislation.

MATERIALS
The production of concrete is responsible for 5 per cent of the world's greenhouse gas emissions. In a normal passive house, greenhouse gas emissions from production of building materials are equal to the emissions from operation. The pilot projects must use building materials with low greenhouse gas emissions, such as for instance wood or low-carbon concrete. The design should also be aimed at minimising the use of building materials. In the future, pilot projects that are designed for dismantling should be encouraged. Then building materials and building components can be used in new buildings instead of ending up as waste.

Photo: Tove Lauluten, Geir Anders Rybakken Ørslien

Photo: LINK arkitektur AS/Hundven-Clements Photography

What used to be innovative madness, is now the natural way of thinking.

Tore Opdal Hansen, mayor Drammen municipality

Photo: Tove Lauluten

Ambitious Developers

FutureBuilt cooperates with ambitious developers who see it as a competitive advantage to be an environmentally leading company. FutureBuilt is a programme for innovation, and the pilot projects are expected to reflect this. They will explore practices that are not "business as usual" in the construction industry. This involves new methods, concepts, technologies and products. Some of the pilot projects will also serve as research case studies.

THE FUTUREBUILT METHOD

The process with the pilot projects follows more or less this path:

1. Contact is established between FutureBuilt and the developer of a pilot project. The municipality is part of this dialogue.
2. Discussions on ambitions for the pilot project. If the project is ambitious enough the developer submits an application to join FutureBuilt.
3. A committee led by the municipality decides if the project can join FutureBuilt, and an agreement is signed between the developer, the municipality and FutureBuilt.
4. If there is not yet a design team commissioned for the project, FutureBuilt will help the developer to organise an architectural competition.
5. The building application is given high priority by the involved municipalities.
6. FutureBuilt serves the developer and the construction team with workshops to help the projects achieve their ambitious environmental targets.
7. The developer uses a greenhouse gas accounting tool and estimates the carbon footprint for the pilot project. This is done for a reference building, the building as designed, as built and in use.
8. FutureBuilt arranges construction site visits and opening seminars connected to each pilot project. The annual FutureBuilt conference and several seminars and study trips are also important in order to showcase the pilot projects and share experiences with other projects.
9. FutureBuilt communicates the pilot projects through our newsletters and website, social media, articles in newspapers and magazines.
10. The pilot projects are documented in the national database of sustainable architecture.

Cities Fight Climate Change

The Oslo region has the fastest growing population in the country and must adapt to the increase in the number of inhabitants. At the same time there is an increased demand for environmentally-friendly construction and lower emissions of greenhouse gases.

The mayors of Oslo, Bærum, Asker and Drammen work together rather than separately. They recognise the necessity of using their position as planning authorities and owners of sites and public buildings actively and strategically. As planning authorities, they can plan climate-friendly areas with higher urban density in the right places, and they understand the benefit to the economy in the reduction of energy and area usage through environmentally-friendly building. Active climate politics is about thinking and acting smart.

TOMORROW'S URBAN SOLUTIONS

The four mayors see the necessity of compact development where there is best access to public transport and thus make it more attractive for people to walk, cycle or use public transport. It is also necessary to follow and encourage the latest developments within building technology and make it more popular both for the building industry and individuals to choose green solutions.

As mayors in some of Norway's fastest growing areas they see that they have to think big, be courageous and take risks in order to create true innovation.

FutureBike

The cross-party climate agreement states that the growth in people transport must be met by public transport, walking or cycling. Therefore, Oslo, Bærum, Asker and Drammen have launched FutureBike, a mutual declaration to improve the cycling facilities. The city councillor for urban development in Oslo and the mayors of Bærum, Asker and Drammen signed the agreement at the FutureBuilt conference 2015. There are four aims in the cycling declaration:

1. Best practice parking norms
2. Bicycle-friendly municipal businesses
3. Bike & ride – bicycle-friendly stations and transport hubs
4. Develop a bicycle culture for children and young people

FutureBuilt is a tool for achieving our energy and environmental goals.

Lene Conradi,
mayor Asker municipality

Photos: Tove Lauluten

FutureBuilt+

FutureBuilt wishes to demonstrate the possibility of constructing energy positive buildings of all types: houses, offices, schools, kindergartens, sports centres and business premises. FutureBuilt+ is a series of plus-energy housing competitions. Building regulations will soon require passive housing. Regulations for buildings with near net-zero energy are forecast by EU from 2020. For FutureBuilt pilots it it important to stay in front and try this out now.

Get a bike. Break free!

How can we plan the Oslo region to ensure that the bike becomes the preferred means of transport, by itself or in combination with the train or other public transport? In order to get good and creative answers to this question, FutureBuilt, launched the international competition *Get a bike. Break free!* in 2014. The competition invited a broad range of participants. Some of the ideas are fast becoming reality, and several ideas are already in effect. “Look to Oslo” said Michael Colville Andersen, the Danish cycle guru, in 2016. Now the municipality of Oslo has more people working with bicycling than Europe´s bicycle capital, Copenhagen.

Ill.: Christensen & Co arkitekter a/s. Photo: Tove Lauluten

Architecture Competitions

FutureBuilt desires a focus on innovation and quality, both with respect to climate, architecture and city environment. FutureBuilt therefore like most of the pilot projects to be the result of architecture competitions. FutureBuilt aids the developers to incorporate quality criteria into the programme for the competition and in putting together the jury. In addition, FutureBuilt also markets the competition and presents the results.

Annual Conference

The FutureBuilt conference is arranged every year in June and has become Norway's most important conference for climate-friendly architecture and urban development. The idea of the conference is to show that climate neutral urban areas, based on high quality architecture, are both possible and attractive. The conference assembles around 500 participants every year, including politicians, property developers, architects, urban planners and consultants from all over Norway.

Oslo Architecture Triennale

In 2015, FutureBuilt became an associated partner in Oslo Architecture Triennale (OAT). The festival is Scandinavia's biggest architecture festival and an important meeting place for discussion of architecture and urban development. Through exhibitions, conferences, debates, excursions and publications OAT challenges the architecture profession and encourages the public to reflect on what makes a good city.

Ill.: Entra ASA/ Code: arkitektur AS. Photo: Tove Lauluten

FutureBuilt Projects

Furuset: Climate-friendly City Development, Oslo.

Furuset is an area project in FutureBuilt. Revitalisation of the 1970s suburb is the basis for the commitment, and is a topic which has the potential for transfer of knowledge gained to similar areas both nationally and internationally.

Today, Furuset has 9500 inhabitants, and 3800 of these live within the demarcation plan for regulation of the Furuset area. It is a multicultural population especially amongst young people. The area has good public transport coverage with bus and metro, and considerable potential for development at the transport hub. Furuset has large green areas, but the E6, the main north-south road, creates a barrier towards Østmarka – a forested area to the east of Oslo.

In 2014, Oslo´s city planning department published their suggested plan for effective climate-friendly city development at Furuset. The masterplan is an important governmental tool to ensure that the overall concept and guidelines for the individual properties contribute to climate-friendly development. The planning proposal´s principles are also in line with FutureBuilt´s criteria for climate-friendly development.

The central concept of the plan is to establish two intersecting urban spaces. A new 'town street' will create an urban structure in the east-west direction, while a continuous park throughway will be established for north-south communication. The establishment of a cohesive blue-green structure with natural storm water systems and re-opened streams are central elements in upgrading the outdoor spaces. Quality standards ensure varied residential buildings with high architectural quality. Trygve Lies Square lies where the two town spaces meet and forms the heart of the plan.

The overall goal is subdivided as follows:

1. Densify the public transport hub
2. Upgrade public spaces
3. Implement effective energy solutions
4. Use a high level of innovation

Four projects will form the starting point for the development of the area. The projects have been chosen on the basis of feasibility and the effect the initiatives are expected to have on greenhouse gas emissions, the overall project goals, and the potential for learning to be transferred to other projects.

- Climate-friendly building yard: In this project the city council will test out new ways of developing its own properties that contribute to climate-friendly city development.
- Trygve Lies Square: This project will contribute to make the spaces Bygata and Trygve Lies Square attractive to inhabitants and visitors to Furuset. The project will show in practice how pedestrians, cyclists and public transport can be given clear priority.
- Energy solutions: A climate-friendly, economically-viable, innovative and attractive energy solution for the area that uses excess heat and delivers green comfort to its users.
- School and nursing home: Both of these buildings will be FutureBuilt projects, and include new elements defining how the city council can be a driving force for innovative processes and solutions.

Photo: Jens Fremming Anderssen

Bjørnsletta School

Oslo

Client: Undervisningsbygg Oslo KF
Architect: L2 Arkitekter, Østengen & Bergo AS
Completed: 2014

This elementary and middle school achieves passive house standard and scores highly on environmentally-friendly material use and transport.

The property benefits from good solar access, and borders a small forest with pine trees to the south. The ground floor of the school is built into the hillside with three smaller separate building volumes above. A multi-purpose sports hall is situated beside the main entrance. Specially equipped spaces and an auditorium are located on the ground floor. The students will have access to information boards on the environmentally-friendly materials used, and on the daily use of energy and water in the building.

The energy consumption of Bjørnsletta school will meet passive house criteria. The building´s heating requirements are reduced because of good insulation and good windows, minimised cold bridges and high air-tightness values. The energy needs for ventilation are reduced through demand controlled and energy efficient fans, and the lighting system is energy-efficient and demand controlled. Bjørnsletta school and sports building will use a heat pump based on energy wells for space heating and DHW, and for cooling in the summer months.

Optimising of the technical control systems has been an important part of this project. Detailed material analyses have been carried out to reduce the emission of greenhouse gases and to collect knowledge for future school projects.

LOW CARBON STRATEGIES

- Passive house
- Extensive use of automation to ensure an optimal indoor climate and energy use
- Minimise material consumption, i.e. use of bubble deck
- Minimum parking allocation, new walkway and extended bike parking

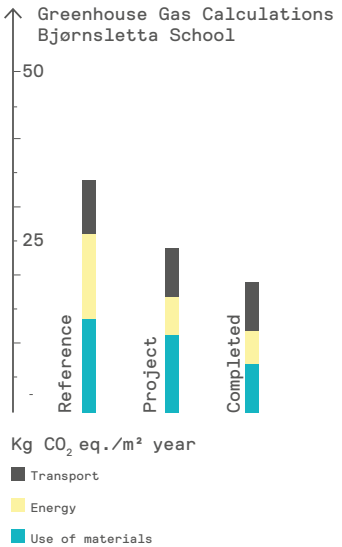


Photo: Tove Lauluten

Gullhaug torg

Oslo

Client: Avantor AS
Architect: Snøhetta as

A 16-floor multifunctional building is planned with clean natural ventilation in the office space and nearly net-zero energy use without the need for purchased energy for ventilation, heating or cooling.

Nydalen in Oslo will be developed further, and the property owner, Avantor, designed a masterplan for the development until 2030 called Nydalen+. In the centre of Nydalen and in immediate proximity to the underground station is Gulhaug torg, where an attractive, multifunctional building is going to be built. The building will consist of homes/offices/businesses and will by means of integrated design, where architecture and technology complement each other, demonstrate how a sustainable building can be simpler and more robust than is the case today. The building will have qualities which compared to buildings with mechanical ventilation will need lower investment costs in the technical systems, simpler operation, less need for maintenance, less need for adaption to tenants requirements, longer life and a better overall experience for the users.

LOW CARBON STRATEGIES

- "Triple-zero": 0 kWh purchased energy for ventilation, heating and cooling
- Natural and hybrid ventilation
- Heating and cooling system based on geothermal heating/cooling and low temperature heating and cooling in walls and floors
- Integrated solar panels in the roof/roof garden
- Material consumption and solutions with low maintenance and replacement, simple operation and long lifetime.
- Situated by a public transport hub
- No car parking in the building and bicycle parking well over the minimum demanded

Ill.: Snøhetta/MIR

Kistefossdammen Kindergarten

Asker

Client: Asker kommune
Architect: Christensen & Co arkitekter a/s
Completion: 2017

A kindergarten with six departments which will be in the forefront of pedagogics, technology and building design.

In the next few years, Heggedal will undergo a major renewal and be developed into the second centre of the Asker council area. A new train station and the first part of a new pedestrian and cycle bridge were completed in 2012. The new road bridge over Heggedal station was completed in 2015 and new housing, businesses, and offices are being built beside the train station. Many families with children have already moved to the area, and there is a need for a new kindergarten.

Asker city council is part of FutureBuilt´s commitment to plus-energy house competitions, and in 2014 Asker launched the first one for its new kindergarten in Heggedal, Plushouse for powerkids. A property beside Kistefoss pond was selected as the site for the kindergarten that will house six groups of children. The kindergarten will be in the forefront of pedagogical, technological and building design. Five very competent teams were chosen to participate in the competition. At the beginning of March 2015 the winning project was announced: *Solbyen* designed by Christensen & Co arkitekter a/s.

Solbyen illustrates an exciting kindergarten rich in content and with good possibilities for flexible use. The project's energy concept is an integrated and natural part of the overall architectural expression. Natural and environmentally friendly materials that will age well have been chosen.

LOW CARBON STRATEGIES

- Plus-energy house
- Environmentally and climate-friendly material use
- Good facilities for cycling and walking
- Located near Heggedal train station and centre of Heggedal

Ill.: Christensen & Co Arkitekter a/s

The New Munch Museum

Oslo

Client: Oslo kommune, Kultur- og idrettsbygg
Architect: estudio Herreros (Spain), LPO arkitekter AS
Completion: 2019/2020

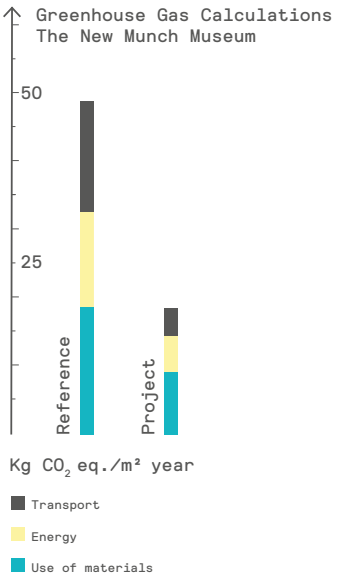
LOW CARBON STRATEGIES

- Passive house
- An external skin with good insulation, very good windows and low cold-bridging values
- High heat recovery and a high use of recycled air
- Energy efficient lighting system
- Low-emitting materials like glass, concrete, wood, stone and tiles
- Location near Norway´s most important public transport hub

The new Munch museum is located on the east side of the Aker River in Bjørvika. The plan and design competition was won by the Spanish architect firm estudio Herreros in the spring of 2009, with the concept Lambda.

Lambda is based on the idea of a vertical museum. The building consists of a tower of 12 storeys, placed on a three-storey podium. The tower consists of a static and a dynamic part. The static part is an opaque concrete structure that satisfies the requirements of security, climate and daylight control associated with the artwork. The dynamic part contains the vertical communication area for visitors, with a transparent and open façade with a view across the city.

The façade is a ventilated skin consisting of an external layer of corrugated, perforated aluminium sheets. This façade responds to the functional requirements connected to climate and energy, maintenance, daylight penetration and appearance. Oslo´s city council has set ambitious environmental goals for the project, with a requirement that the building should be at the forefront both with regard to energy saving and reduced greenhouse gas emissions. The project work requires an integrated energy design process and sets high demands on all involved parties.



Ill.: estudio Herreros

Papirbredden 2 and 3

Drammen

Client: Papirbredden Eiendom
Architect: LPO Arkitekter AS
Completion: 2012 and 2015

Two office buildings in Drammen with passive house standard, energy class A and good facilities for cyclists.

Papirbredden 2 is one of Norway's first office buildings built as a passive house and is part of Papirbredden knowledge park. Papirbredden 3 is the third and final stage of the knowledge park, which is located in the city centre of Drammen. This area, where the Union paper factory was originally located, has been transformed into a new and exciting urban district.

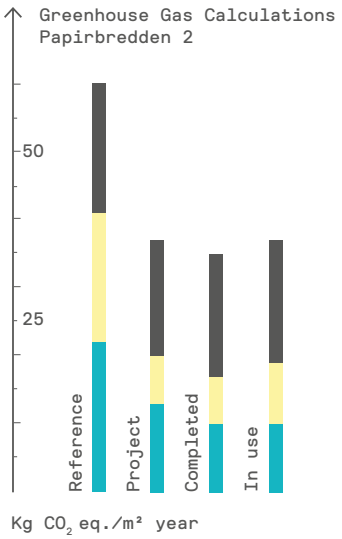
Papirbredden 2 has a compact design with a short façade in order to reduce energy requirements and greenhouse gas emissions. One of the main goals for material use has been to reduce the amount of concrete, reinforcement and steel constructions to a minimum.

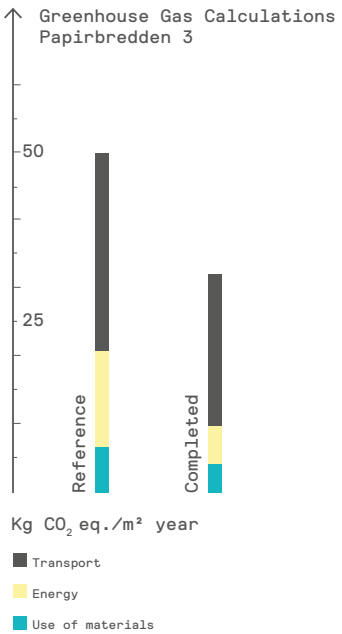
The office area has 30 per cent cell offices. These have small window surfaces towards the south and east to reduce the risk of overheating during the summer. Towards the north and north-west there are large glass facades with triple pane glass, reducing the need for artificial light. On the west side, the building is slanted to reduce the need for solar screens and give the best possible working environment for the users.

Papirbredden 3 maintains the high ambitions of Papirbredden 2, but with further improvements such as eliminating mechanical cooling, increased aggregate content in concrete, a sedum roof and lower energy use.

LOW CARBON STRATEGIES

- Passive house and Energy Class A
- Energy from geothermal wells and district heating
- Optimised material consumption through prefabrication and conscious choices in the early stages of the project
- Focus on replacement of environmentally damaging materials
- Centrally located close to a transport hub for bus, train and bicycle
- Large number of bicycle parking places and a bicycle workshop



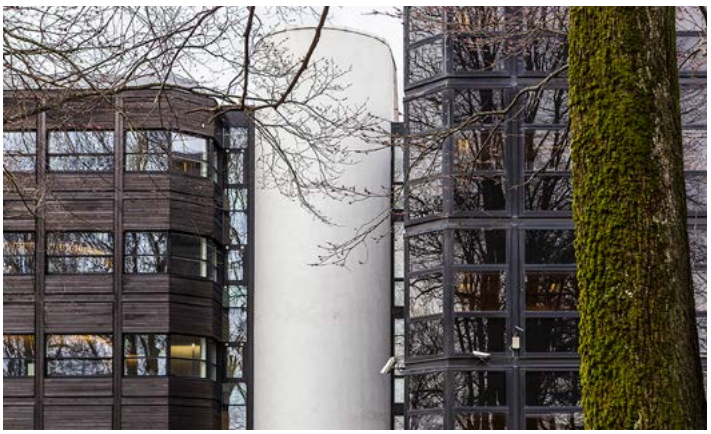


Ill.: Thomas Bjørnflaten

Powerhouse Kjørbo

Bærum

Client: Entra Eiendom AS
Architect: Snøhetta as
Completed: 2014



Powerhouse Kjørbo is the world´s first rehabilitated office building that produces more energy than it uses.

Powerhouse Kjørbo consists of two ordinary office blocks from the 1980s that have been transformed to an up-to-date and modern office facility. The goal over the lifetime of the buildings is to produce more energy than they use. With the help of photovoltaics Powerhouse Kjørbo will produce over 200 000 kWh per year. The electricity will be delivered to the technical systems of the building and periodically also to the local grid.

Combining extreme energy performance with good indoor air quality, low environmental impact and robust solutions, all on a commercial basis, demands a different approach than in traditional building projects. The key to success lies in integrated, holistic solutions that require cooperation.

The interdisciplinary design process has contributed to new and innovative solutions. Powerhouse Kjørbo is the first project that the Powerhouse cooperation has completed, and it is the first time a building has been rehabilitated as a plus-energy house. The method can easily be transferred to other office buildings.

At the outset of this process the city council expressed a requirement for the building to retain its original appearance. This has been an important condition which for the most part has been met. The glass panels that were previously used as a façade material have been replaced with burned aspen, which is much better for embodied energy than glass.

LOW CARBON STRATEGIES

- Energy concept based on integrated and holistic solutions
- A large photovoltaic system
- Thermal energy supply based on energy wells, heat pumps and use of excess heat from server facilities, optimised according to heating and cooling requirements
- Materials with low embodied energy, such as external cladding of burnt wood and reusing of façade panels in glass
- Training of maintenance personnel, and careful follow-up of daily energy use

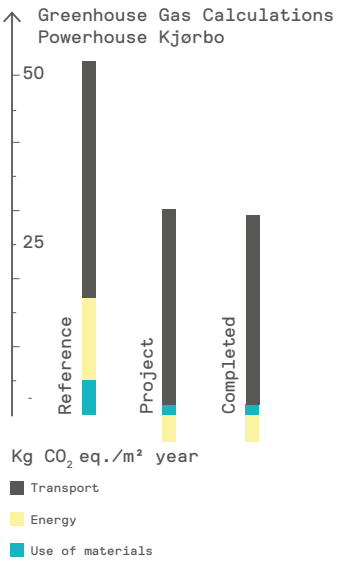


Photo: Tove Lauluten

Ulsholtsveien 31

Oslo

Client: Stiftelsen Betanien Oslo
Architect: Haugen/Zohar Arkitekter, Dronninga Landskap, Steinsvik Arkitektkontor
Completion: 2017

LOW CARBON STRATEGIES

- Compact building and area-efficient homes
- New buildings built as passive houses
- Geothermal heat, solar panels, solar thermal collectors, greywater recycling
- Ventilation with heat recycling in a wall module for each residential unit
- Solid wood construction
- Good bicycle facilities

The low carbon first-home residences in Ulsholtveien 31 are situated at Furuset, which is Oslo municipality's area project in FutureBuilt.

Stiftelsen Betanien Oslo and FutureBuilt opened for a limited plan and design conference in June 2013. This was won by Haugen/Zohar Arkitekter, Steinsvik Arkitektkontor and Dronninga Landskap with the proposal *God morgen Alna.*

An existing residential building on the site is being rehabilitated and converted to house nine flats with a communal area on the ground floor. In addition, two new buildings with 27 flats are being built adjacent to each other. The residences are arranged around a large communal garden which is open to a recreational area to the south.

A shared geothermal heat pump will be the main energy source for heating and water both in the existing building and the new ones. The new housing is planned to passive house standard where solar panels on the south-facing roofs will contribute to electricity production. The building envelope of the existing building will be upgraded to present day standards, and will have a solar thermal collector on the roof and heat recycling of greywater. The new buildings will be constructed with cross-laminated timber. Plans include charging stations for electric cars, a bicycle pavillion with workshop and a bicycle pool.

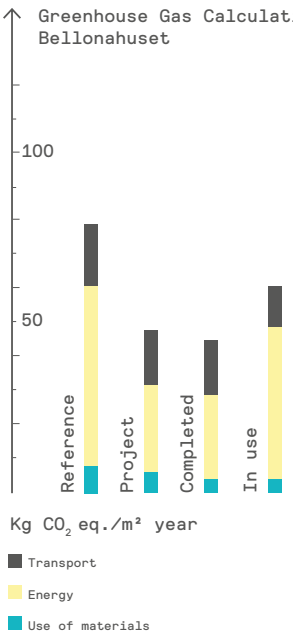
Ill.: Haugen/Zohar arkitekter, Steinsvik Arkitektkontor, Dronninga Landskap

Bellonahuset
Oslo

Client: Aspelin Ramm
Architect: LPO Arkitekter AS
Completed: 2010

The headquarters of the Bellona Foundation has a characteristic south façade with integrated solar panels that reduce solar exposure.

LOW CARBON STRATEGIES
- Passive house standard, energy class A
- Local energy centre for the whole area
- Integrated solar panels that reduce solar exposure
- Central location and close to public transport



Bergsliens gate 12 B-C
Oslo

Client: Boligbygg Oslo KF
Architect: RiK Arkitektur AS
Completed: 2016

Listed building which has been rehabilitated while preserving its historic character.

LOW CARBON STRATEGIES
- Reinsulate the building while safeguarding the original character
- Test and explore innovative lime plaster with insulating abilities
- Establish bicycle and pram parking with a green roof

Brynseng School
Oslo

Client: Undervisningsbygg Oslo KF
Architect: HRTB Arkitekter AS, Bjørbekk & Lindheim AS
Completion: 2017

Brynseng school is being built as a nearly net-zero energy building (nZEB).

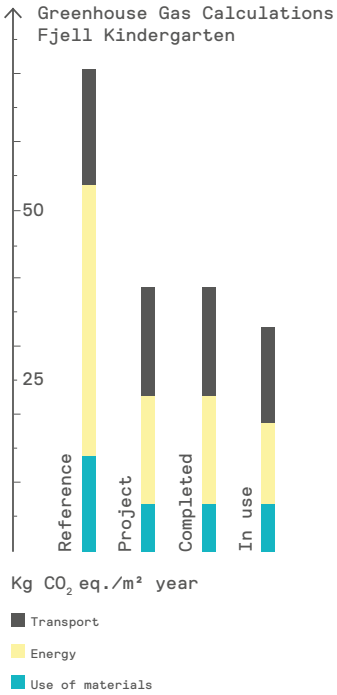
LOW CARBON STRATEGIES
- Nearly net-zero energy building
- Solar panel façade of 1100m²
- Location close to public transport
- No car parking
- 440 bicycle parking places

Fjell Kindergarten
Drammen

Client: Drammen Eiendom KF
Architect: Code: arkitektur AS, Hindhamar Landskaparkitekter AS
Completed: 2010

Passive house kindergarten built in cross-laminated timber with a ground source heat pump.

LOW CARBON STRATEGIES
- Passive house
- Ground source heat pump (from energy wells)
- Prefabricated solid wood elements
- Reduced parking facilities

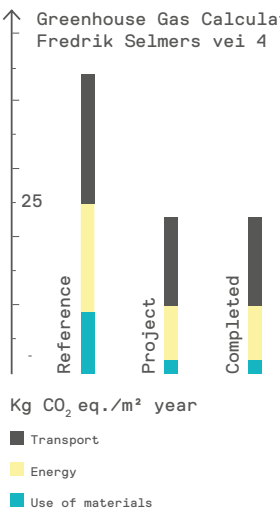


Fredrik Selmers vei 4
Oslo

Client: Entra Eiendom AS
Architect: LPO arkitekter AS, Atsite, Scenario
Completed: 2013

Climate-friendly and cost-effective rehabilitation of an office building.

LOW CARBON STRATEGIES
- Passive house standard, energy class A
- Local energy centre provides the building with heat, cooling and domestic hot water
- Energy effective and demand controlled lighting
- Use of recycled aluminium, low carbon concrete
- The main materials are documented with EPDs (Environmental Product Declaration)
- Location close to public transport

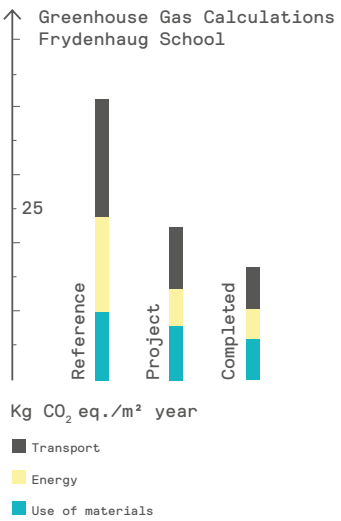


Frydenhaug School
Drammen

Client: Drammen Eiendom KF
Architect: Terje Grønmo Arkitekter AS, Rambøll AS, Hindhamar Landskapsarkitekter AS, Rambøll AS
Completed: 2014

A solar thermal system and drilled wells with seasonal recharging will reduce the need for delivered energy.

LOW CARBON STRATEGIES
- Passive house, energy class A
- Solar thermal system on the roof
- Drilled wells with seasonal recharging
- Sedum roof that contributes to reducing storm water runoff
- Low-carbon concrete and recycled steel
- Focus on materials with low greenhouse gas emissions



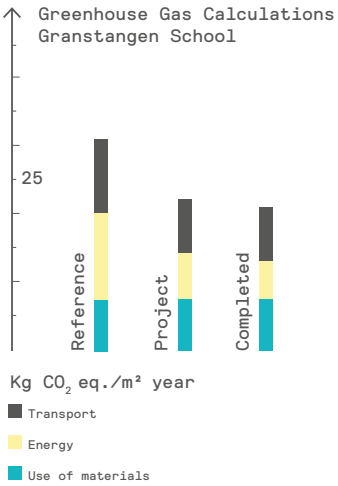
Granstangen School
Oslo

Client: Gran Skolebygg AS / Backe Prosjekt AS
Architect: Arkitektgruppen Lille Frøen AS, Asplan Viak AS
Completed: 2015

The school is the first project in the FutureBuilt programme that has been completed at Furuset, which is Oslo city council´s pilot area for climate-friendly city development.

LOW CARBON STRATEGIES

- Passive house
- Geothermal heat pump that covers at least 80 per cent of space heating requirements, ventilation and DHW
- Use of low carbon concrete and recycled steel
- Parking facilities for cars is set at a minimum. Good facilities for bikes.



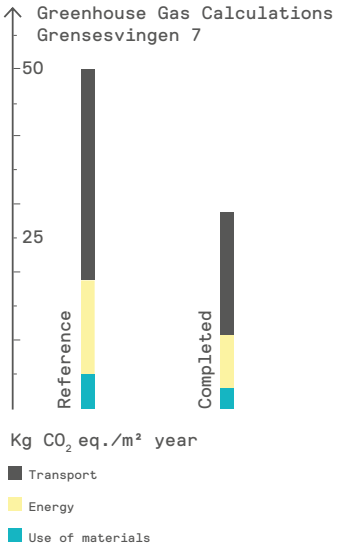
Grensesvingen 7
Oslo

Client: Grensesvingen 7 AS
Architect: KIMA arkitektur as, Grindaker landskapsarkitekter
Completed: 2014

Climate-friendly rehabilitation of an office building through retention of the existing structure and most of the façade.

LOW CARBON STRATEGIES

- Energy class A
- Decentralised ventilation, demand controlled
- Certified BREEAM Excellent | Low energy building
- Extensive reuse of materials
- Retention of the existing structure and much of the brick façade
- Location close to public transport
- Good facilites for indoor bike parking.



Gulskogen Park
Drammen

Client: Assistanse Nye Eiendommer AS
Architect: Line Solgaard Arkitekter AS, Link Arkitektur AS Landskap

New climate-friendly and universally designed head office

LOW CARBON STRATEGIES

- Passive house standard, energy class A
- BREEAM-NOR Excellent Certification

Hamang
Bærum

Transformation of an industrial area near the train station in Sandvika to a residential and recreational area.

LOW CARBON STRATEGIES
- Reuse of industrial buildings and high environmental qualities for the new development
- Handling the stormwater challenge as an important design parameter
- Use of the BREEAM Communities system for the planning process

Holmen Swimming Pool
Asker

Client: Asker kommune
Architect: ARKiS arkitektar
Completion: 2017

New swimming pool which will save and produce electricity.

LOW CARBON STRATEGIES
- Passive house
- Bicycle parking with 650 m^2 roof of photovoltaic panels
- Solar thermal collector on the car parking area
- 15 geothermal wells for energy supply
- Use of low carbon concrete
- Low availability of car parking and good facilities for bicycles and electric car parking

Kilden Kindergarten
Oslo

Client: Omsorgsbygg Oslo KF
Architect: Link Arkitektur AS,
Link Arkitektur AS Landskap

Plus-energy house kindergarten where solar panels are an integrated part of the architecture.

LOW CARBON STRATEGIES
- Plus-energy house
- Local energy production by using photovoltaics as the roofing material
- Environmentally and climate-friendly material use
- Good solutions for cyclists and pedestrians

Lilletorget 1
Oslo

Client: Entra Eiendom AS
Architect: Code: arkitektur AS, Rambøll, Institute for Energy Technology

Winning concept for a new life cycle based business premises in central Oslo.

LOW CARBON STRATEGIES
- Plus-energy house: production of excess energy at a minimum of 2 kWh/m^2
- C2C principle: re-use instead of just recycling
- Especially well-planned solutions for bicycles
- A study area for urban biodiversity is integrated in the project

Marienlunden
Oslo

Client: Marienlunden AS
Architect: Fjord Arkitekter AS

Residential and business premises in cross-laminated timber.

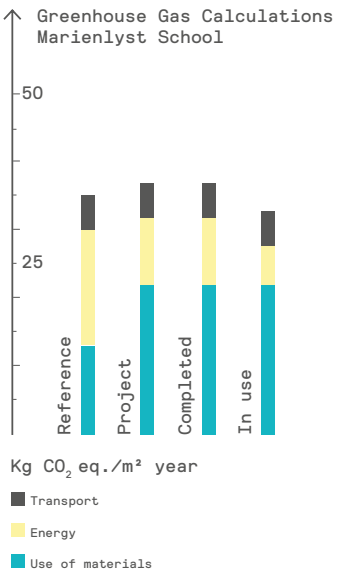
LOW CARBON STRATEGIES
- Nearly net-zero energy house, plus-energy house
- Use of cross-laminated timber
- Good facilities for bikes and e-bikes both indoors and outdoors

Marienlyst School
Drammen

Client: Drammen Eiendom KF
Architect: div.A arkitekter, Bjørbekk & Lindheim AS
Completed: 2010

First passive house school in Norway.

LOW CARBON STRATEGIES
- Passive house
- Ventilation, heating and lighting is demand controlled
- Connected to a communal low-temperature local heating network.
- Reduced car parking facilities
- Good facilities for bike parking



The New National Museum for Art, Architecture and Design

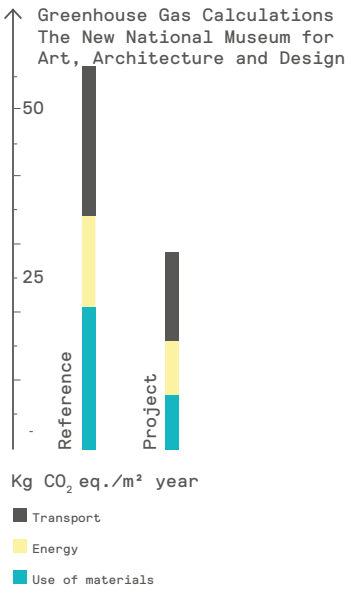
Oslo

Client: Statsbygg
Architect: Kleihues+Schuwerk Gesellschaft von Architekten mbH
Completion: 2019

Norway´s largest cultural building has high environmental ambitions and will be built using robust materials that can withstand the test of time.

LOW CARBON STRATEGIES

- Compact building
- Passive solutions to reduce energy use (heavy wall construction)
- Heat pump with seawater
- Climate friendly materials
- Centrally location, near public transport and central functions



NSB Kompetansesenter

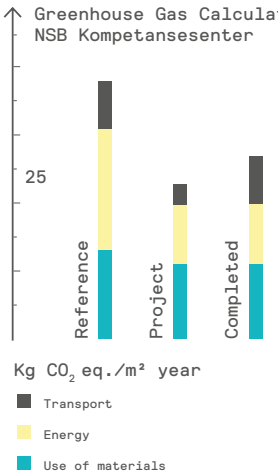
Drammen

Client: Drammen Eiendom KF
Architect: div.A arkitekter, Bjørbekk & Lindheim AS
Completed: 2010

The façade with moveable glass louvres and perforated steel sheeting showcase the buildings low energy strategies.

LOW CARBON STRATEGIES

- Compact building and efficient use of space
- External solar shading reduces the need for cooling
- Simple geometry which simplifies airtightness, insulation and makes the building less vulnerable to wind
- Materials with low environmental impact



Nydalsveien 23B

Oslo

Client: Avantor
Architect: SAAHA, Lala Tøyen
Consultants: Degree of Freedom, Gether

A historic building which will be redeveloped into climate friendly, high-quality housing.

LOW CARBON STRATEGIES

- Nearly net-zero energy building, ”active house technology”
- Reuse of an existing, listed building, reuse of building materials
- Extensive use of timber will be explored
- Green roofs, local surface water solutions, urban farming
- Communal living solutions and car sharing
- Good facilities for indoor bike parking with the necessary amenities for washing and maintenance of bicycles
- Location close to public transport

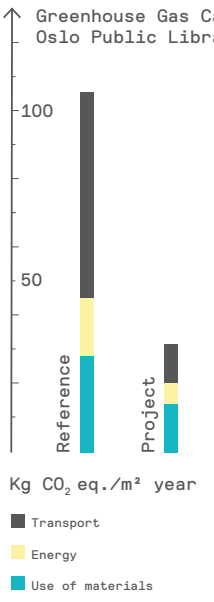
Oslo Public Library (Deichmanske bibliotek)
Oslo

Client: Oslo kommune, Kultur- og idrettsbygg
Architect: Lund Hagem Arkitekter AS, Atelier Oslo
Completion: 2019

New public library built with a translucent and climate-friendly façade.

LOW CARBON STRATEGIES

- Passive house
- District energy network
- Newly developed transparent composite façade
- Cooling of concrete slabs
- Heating and cooling from a central energy system based on seawater
- Central location and no car parking facilities
- Use of low carbon concrete, recycled steel reinforcement and recycled steel



Posthuset
Oslo

Client: Entra Eiendom AS
Architect: schmidt hammer lassen architects, LOOP architects, COWI AS

High-rise, climate-friendly building rehabilitation.

LOW CARBON STRATEGIES

- Energy use is halved and the ambition is for net-zero energy use
- “Cradle to Cradle” as design strategy, including re-use of the existing primary structure and other materials and components
- Centrally located with a direct connection to Norway´s largest public transport hub
- Reallocation of underground parking from cars to bicycles

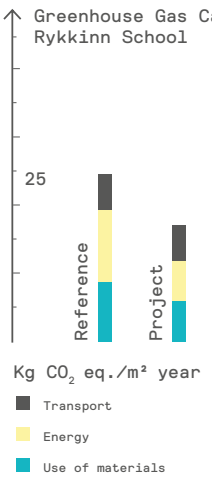
Rykkinn School
Bærum

Client: Skuleveg AS
Architect: Arkitektgruppen Lille Frøen AS, Bjørbekk & Lindheim AS, Kapsel design as
Completed: 2016

Passive house school with focus on good daylight conditions.

LOW CARBON STRATEGIES

- Passive house standard
- Optimisation of the building frame with respect to material usage, U-values and airtightness
- Efficient heat pump and local energy wells
- Environmentally-friendly materials focusing on the largest possible reduction in CO2 emissions
- Transport solutions which facilitate the possibility of walking and cycling



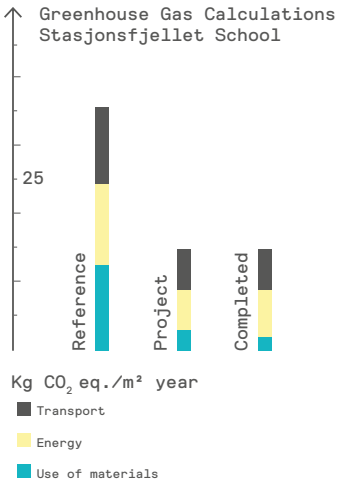
Stasjonsfjellet School
Oslo

Client: Undervisningsbygg Oslo KF
Architect: Heggelund og Koxvold AS Arkitekter
Completed: 2014

One of the Norway´s first schools rehabilitated to passive house standard.

LOW CARBON STRATEGIES

- Passive house
- Roof and façades are well insulated to achieve the lowest possible heat loss
- Water-borne heating with a geothermal heat pump
- New ventilation system
- Maintenance-free façade of heartwood of pine gives low greenhouse gas emissions
- Upgraded path from the train station



Strømsø
Drammen

Strømsø is an area in the city of Drammen that will be developed into a low carbon neighbourhood with both businesses and residences. Drammen´s train station, which is the fourth busiest in Norway, is located in Strømsø.

LOW CARBON STRATEGIES

- Increased density with high architectural and environmental quality
- Increased energy-efficiency of the existing building stock
- Numerous pilot projects in FutureBuilt located in the area

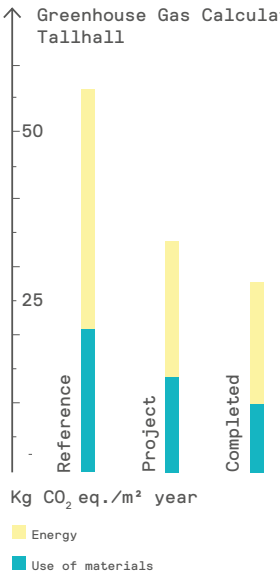
”Tallhall” – Meteorological Institute
Oslo

Client: Meteorologisk institutt
Architect: Pir II Oslo AS, Arkitekturverkstedet i Oslo/Asplan Viak
Completed: 2011

Passive house annex using innovative material solutions.

LOW CARBON STRATEGIES

- Local heat pump and waste heat from data centre
- 40 per cent reduction of greenhouse gas emissions from material use
- Low carbon concrete
- Location close to bus and metro
- Car parking reduced by 36 per cent
- Covered and secure bicycle parking



Trans'matorn Bicycle Park
Asker

Client: Asker kommune
Architect: Driv Arkitekter AS
Completed: 2015

Arena both for play and building cycling skills in a safe environment.

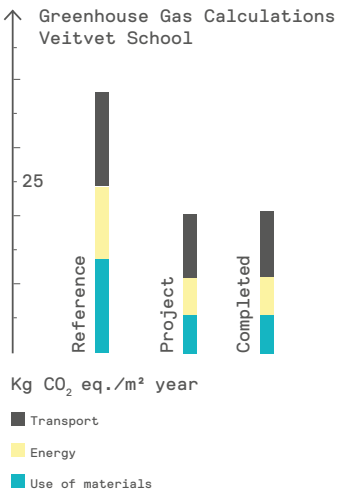
LOW CARBON STRATEGIES
- Environmentally-friendly materials
- Material re-use plan: local materials
- Proximity to Heggedal train station and bus stops
- Proximity to Heggedal centre and its residential areas

Veitvet School
Oslo

Client: Skanska Eiendomsutvikling
Architect: Link Arkitektur AS,
Link Landskap
Completed: 2015

The school has a clear environmentally-friendly profile with a tilted entrance façade covered in solar panels.

LOW CARBON STRATEGIES
- Passive house
- Use of thermal mass
- District heating and solar heat collector in the façade
- Low carbon concrete and wood external cladding
- Proximity to public transport and good facilities for the use of bicycles

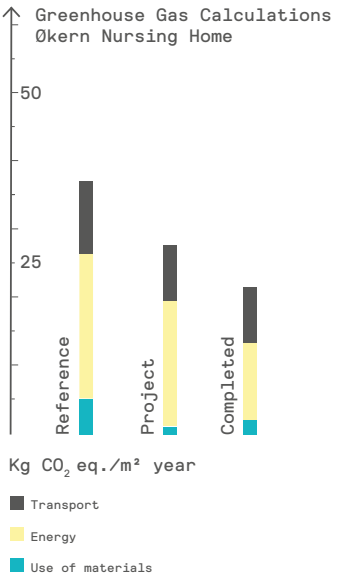


Økern Nursing Home
Oslo

Client: Omsorgsbygg Oslo KF
Architect: Bølgeblikk arkitekter as
Completed: 2014

Rehabilitation project, installing solar panels on the whole roof.

LOW CARBON STRATEGIES
- Installation of photovoltaic system, which satisfies a minimum of 10 per cent of the building´s total energy needs
- New ventilation system with demand control
- Low-energy lighting system
- Use of environmentally-friendly materials



Østensjøveien 27

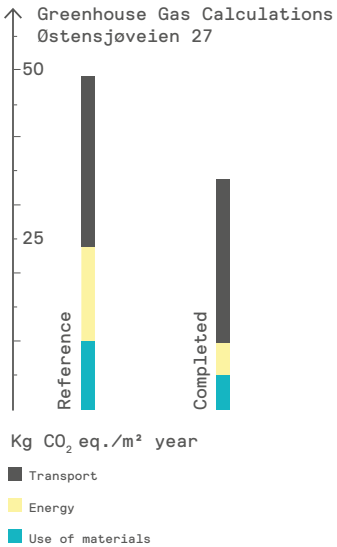
Oslo

Client: NCC Property Development AS
Architect: Henning Larsen Architects AS, PK3 landskabsarkitekter
Completed: 2013

Open office concept “the living building” with the possibility of changing to residential accommodation.

LOW CARBON STRATEGIES

- Passive house
- Compact building and optimized building geometry
- Solar screen integrated in the façade
- Heating uses waste heat from neighbouring industry
- Optimisation of material usage thus reducing total amount of materials
- Use of low carbon concrete and recycled steel
- Reduced car parking and good facilities for bicycles



PROJECTS PHOTOS AND ILLUSTRATIONS
Bellonahuset: Espen Gees
Bergsliens gate 12 B-C: Tove Lauluten
Brynseng School: HRTB Arkitekter AS
Fjell Kindergarten: Espen Gees
Fredrik Selmers vei 4: Tove Lauluten
Frydenhaug School: Drammen kommune
Granstangen School: Tove Lauluten
Grensesvingen 7: Johnny Syversen
Gulskogen Park: Line Solgaard Arkitekter AS
Hamang: haukur landskap
Holmen Swimming Pool: Arkís arkitektar
Kilden Kindergarten: LINK Arkitektur AS
Lilletorget 1: Entra ASA/Code: arkitektur AS
Marienlund: Fjord Arkitekter AS
Marienlyst School: Flashpoint Studio
New National Museum for Art, Architecture and Design: Kleihues + Schuwerk Gesellschaft von Architekten mbH, Statsbygg, MIR
NSB Kompetansesenter: alt.arkitektur
Nydalsveien 32B: SAAHA, Lala Tøyen, Degree of Freedom, Gether
Oslo Public Library: Lund Hagem Arkitekter, Atelier Oslo
Posthuset: schmidt hammer lassen architects, LOOP architects, COWI (DK og NO), Transsolar Energitechnik GmbH, Vugge til Vugge Danmark.
Rykkinn School: Tove Lauluten
Stasjonsfjellet School: Tove Lauluten
Strømsø: Tove Lauluten
Tallhall: Asplan Viak
Trans´martorn: Asker kommune
Veitvet School: Tove Lauluten
Økern Nursing Home: Tove Lauluten
Østensjøveien 27: NCC, kolonihaven.no

FutureBuilt Projects in English

There is a growing international interest in FutureBuilt. Read more on futurebuilt.no.

FutureBuilt Partners

Oslo kommune

DRAMMEN KOMMUNE

BÆRUM KOMMUNE

Asker kommune

Husbanken

Norske arkitekters landsforbund

KOMMUNAL- OG MODERNISERINGSDEPARTEMENTET

DIREKTORATET FOR BYGGKVALITET

enova

Grønn Byggallianse

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AND URBANISM

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