

# BUILDINGS



COWI



# A WORLD OF CHALLENGES

Our world is changing faster than ever. Globalisation is changing political and financial systems. Emerging markets will be the booming economies of the future. And the industrialised parts of the world are adapting to new demographics and citizens' expectations. These enormous changes impose great challenges on the world – but also enormous opportunities.

The face of the Earth is also changing. The world's population is increasing, and more and more people move from villages and farms to live in fast-growing cities.

At the same time, cities are transforming their welfare, energy, education and healthcare services to meet future demands.

This urbanisation process puts enormous pressure on resources, infrastructure and the environment.



# OUR 360° MINDSET

Our formula for success is simple and holistic. We create value for our customers by thinking 360° around the challenges we meet. The 360° approach leads to more coherent solutions for our customers – and ultimately coherence in society at large. In COWI, we apply this mindset in everything we do – internally and externally.



# FULL CIRCLE VALUE CREATION

COWI's value creation exceeds the obvious benefits that meet the eye.

A COWI building, for example, is more than a high-tech engineering solution erected on time and within budget. It also includes many other benefits for the customer, for the end users and for society.

Benefiting from our broad range of competencies, we include everything from user involvement and stakeholder relations over feasibility studies, modelling to life cycle cost and training in our solution. And the list just goes on and on.

So, a COWI building is more than a building. It's a full circle solution, combining the best of many stakeholders, disciplines and competencies. Because we don't believe in quick fixes – anywhere.

COWI has designed green and sustainable buildings since the early 80's when first awareness of limits of natural resources came up.

COWI has designed more than 1000 green and sustainable buildings worldwide and employs 200 specialists in a variety of disciplines within the fields of green and sustainable buildings planning, design, operation and maintenance.





# A MULTIDISCIPLINARY COMPANY

COWI's multidisciplinary approach moves the boundaries and delivers solutions based on our comprehensive understanding of complex projects.

With more than 6,200 employees working in a broad range of professional services, COWI can cover all engineering services across the following business sectors Economics, Management and Planning, Water & Environment, Geographical Information and IT, Railways, Roads and Airports, Building, Industry and Energy, and Bridge, Tunnel, Undergrounds Structures and Marine.

We deliver multidisciplinary services for building projects around the globe. Our specialist expertise within green and sustainable buildings include everything from energy design, indoor climate, climate adaptation and mitigation, green business models, life cycle assessments to cradle to cradle and LEED, BREEAM and DGNB consultancy.

COWI integrates a wealth of engineering, architecture and economic knowledge when developing our projects.

Life cycle cost, sustainability and mitigation of environmental impacts are fundamental to the way we work. Our project teams are created to match the requirements of a multidisciplinary project and we work collaboratively across disciplines managing the interfaces.





## NORDEA BANK HEADQUARTERS

Copenhagen, Denmark

Nordea Bank's new headquarters in Ørestad, close to the city of Copenhagen, is an ambitious sustainable building, aiming at the highest LEED standard – LEED Platinum.

The new building features 46,000 m<sup>2</sup> of sustainable floor area in six floors, of which 5,000 m<sup>2</sup> will be occupied by Northern Europe's largest trading floor and data centre. The bar is set high for the new building, both in terms of architecture and sustainability, and only with a complete focus on the sustainable aspects of the construction process can Nordea's new headquarters achieve the high LEED Platinum certification, which is reserved for the most energy-efficient, environmentally friendly and healthy buildings.

Along with Henning Larsen Architects, we are implementing a number of sustainable initiatives including low energy consumption, a healthy indoor environment including the use of healthy materials, and rainwater management. In addition, focus is on promoting the green identity on the site. In the green areas biodiversity will be secured by, for instance, native vegetation.

### FACTS

› Client:	Nordea Real Estate
› Project period:	2012–2016
› Architects:	Henning Larsen Architects
› Scope:	46,000 m <sup>2</sup> new build
› Building type:	Offices

### SERVICES

COWI provides consultancy within all engineering and design disciplines, including LEED certification, construction management, supervision, indoor climate and energy design.

### VALUE CREATION

The new Nordea Headquarters stands as long-lasting and robust investment for the benefit of not only the investor but also the people working in the building, for nature and society.



## THE POINT

Malmö, Sweden

The high-rise building, the Point, in Malmö suburb Hyllie has involved a wide team of high-rise, soil engineering and sustainability experts from COWI. The goal was to ensure an optimal building design that allows the client and architects flexible options for the spatial arrangements.

COWI's design experts have right from the start worked to incorporate good design principles to ensure that the building is feasible and rational. Especially the building's stability is being scrutinized for various design principles. The environmental target is high as well. The Point has chosen to certify the building according to BREEAM SE aiming at 'Very good'. COWI will provide both a BREEAM Assessor and a BREEAM Accredited Professional.

The very fact that The Point is located close to a railway, presents special challenges for the construction. COWI has therefore also brought out geotechnical experts to determine the optimal foundation principle, ensuring the best possible overall project finance.

### FACTS

› Client:	Annehem Bygg & Projekt AB
› Project period:	2013–2017
› Architects:	Krook and Tjäder
› Scope:	Building of 25,000 m² over 28 floors, 110 metres tall
› Building type:	Mixed use

### SERVICES

COWI has been entrusted with technical design and BREEAM certification (BREEAM Assessor and BREEAM Accredited Professional (AP)) for the building.

### VALUE CREATION

Constructing high-rise buildings in a sustainable way poses certain challenges. The key has been to find the optimum technical design with regard to surface efficiency and production economy, which succeeded to a high degree.





## RIPPLE EFFECT

Oslo, Norway

Ripple Effect was in April 2015 named one of four finalists in the multi-disciplinary design and innovation competition URBAN, hosted by Entra Eiendom and FutureBuilt in Norway. The purpose of the contest was to find the project that best answered the program requirements for outstanding innovation in design and urbanism FutureBuilt criteria and Entra's ambition to be a leader in sustainable real estate development. Ripple Effect consists of 26 floors and is about 111 meters high.

Design requirements for energy performance are in accordance with "energy-positive buildings", entailing that the building will deliver more energy than it consumes (2 kWh / m<sup>2</sup>). COWI's design delivers 3.3 kWh / m<sup>2</sup>. This is achieved with the innovative combination of different technologies, dimensioned in relation to balance internal needs and maximum external delivery. The design is based on the Cradle to Cradle principles to create solutions that maximise the value instead of minimising the negative effects of measures. Analysis of the project shows that the design has good potential for achieving environmental BREEAM-NOR Outstanding.

### FACTS

› Client:	Entra Eiendom
› Project Period:	2015
› Architects:	schmidt hammer lassen architects and LOOP Architects
› Scope:	50,000 m <sup>2</sup>
› Building type:	Offices

### SERVICES

COWI provides consultancy within all engineering and design disciplines.

### VALUE CREATION

The high-end architecture, the flexibility of the building, the extreme low running cost and high indoor climate makes it long lasting and solid investment in asset property.



## CLIMATE-FRIENDLY OFFICE

Copenhagen, Denmark

The new office building of ATP Real Estate Denmark has been designed to match the architecture of the existing warehouses. At the same time it sets new standards for climate-friendly office buildings with an energy-consumption 40 % below present national standard.

The office building was developed in collaboration between architects Lundgaard & Tranberg and COWI. The objective was to create coherence between the architecture and climate-friendly solutions. Different sized windows keep the façade alive, while providing light for work stations and a view to the water wherever you are in the building. The many small windows are very important to obtaining low energy consumption. The heat loss is low when it is cold, and the cooling need is low when it is hot.

An atrium at the centre of the building provides indirect daylight, creating a great visual environment and lowering the need for electric lighting. The building being constructed on the waterfront provided an obvious solution to use sea water as an energy source. In the winter, the water provides heat via a heat pump, and in the summer, the water cools the building through a pipe system, which is cast into the storey partition.

### FACTS

› Client:	ATP Properties A/S
› Project period:	2011-2015
› Architects:	Lundgaard & Tranberg Architects
› Scope:	New climate-friendly office space of 16,000 m² on Langelinie.
› Building type:	Offices

### SERVICES

COWI has provided consultancy on all engineering services including sustainability, DGNB certification, electricity and plumbing, structures, fire and acoustics.

### VALUE CREATION

The 360 approach revealed possibilities for creating a design with lots of daylight and good indoor climate and at the same time reduce energy consumption and running costs for the benefit of the investor, tenant, employees and society at large. The project has also achieved the highest score Gold in the DGNB sustainability certification system.







## URBAN MOUNTAIN

Oslo, Norway

An office building in central Oslo is being renovated and expanded using new and innovative methods to optimise the building's energy consumption and CO<sub>2</sub> emissions. The building will be the tallest in Norway and the first high-rise building in Norway with natural ventilation. The building will be a sustainable landmark for Oslo City and an organism focusing on key qualities that we find in nature: clean air, sensory environments with green plants, water, light and shade. At the same time, the building will meet modern man's need for comfortable, high-tech smart solutions as an integrated part of the future's workplace.

The project has a high level of ambition with regard to energy efficiency and Cradle to Cradle principles (C2C). COWI has tested and developed a number of new solutions in areas of flexibility, biodiversity and recycling of water, heat and organic waste. Solutions include the recycling of waste heat from hot water use and flushing toilets, a bio-digester for converting the organic waste into heat and electricity, energy storage in an ice store, etc. On this basis, the target is to achieve a BREEAM Outstanding certification.

### FACTS

› Client:	Entra Eiendom A/S
› Project period:	2013-2018
› Architect:	schmidt hammer lassen architects, LOOP Architects
› Collaborators:	Transform Solar Energy Teknik, Cradle to Cradle Denmark
› Scope:	79,000 m <sup>2</sup> (50,000 m <sup>2</sup> refurbishment, 30,000 m <sup>2</sup> new construction , 138 metres high and 31 levels)
› Building type:	Mixed use

### SERVICES

COWI provided project management and consultancy on all engineering disciplines.

### VALUE CREATION

Based on principles from Cradle to Cradle thinking, the target is to recycle as much as 90 % of the demolished existing materials into new and upgraded building materials of which 80 % are used directly in the newly refurbished building.



EMPORIA

Malmoe, Sweden

With more than 30,000 plants bedded in 27,000 m², the roof park on top of the new shopping centre Emporia in Sweden, is considered one of the world’s largest. By integrating a variety of innovative sustainability measures in its construction, Emporia aims at meeting ecological and climate related challenges. The purpose of the roof garden is to ensure climate adaption and biodiversity in a cultural landscape.

Besides being a recreational and social arena the plant-covered roof park provides visible and effective answers to reducing a number of environmental impacts: The plants take care of a very large amount of rainwater and create a delay of storm water, while rainwater is discharged to surface water ponds. This way, Emporia’s load on the local drainage system is minimised.

The shopping centre has more than 180 shops and restaurants. Emporia is certified by the internationally recognised certification system BREEAM Europe Commercial, achieving ‘Very Good’.

FACTS

- › Client:
- Steen & Strøm Sverige AB
- › Project period:
- 2008-2012
- › Architect:
- Wingårdh Arkitektkontor AB
- › Scope:
- 93,000 m² divided on 3 floors
- › Building type:
- Shopping centre

SERVICES

COWI provided consultancy on all engineering disciplines.

VALUE CREATION

Both social and ecological sustainability was emphasised in the construction of Emporia. Numerous measures were taken to create an accessible, pleasant and inviting environment, and Emporia is a strong contribution to the local environment. Emporia has integrated innovative sustainability measures, directed at relevant ecological and climate related issues, and in addition created an outdoor space for activity and relaxation available



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## NANJING GREEN LIGHTHOUSE

Nanjing, China

Nanjing Green Lighthouse serves as an exhibition centre for sustainability and urban planning and provides office and conference facilities to the administration of Nanjing High Tech Zone. The building is inspired by the Copenhagen Green Lighthouse – Denmark's first CO<sub>2</sub> neutral building.

COWI in China, together with the Chinese architecture and urban planning company Archiland International, have designed the building and developed the advanced energy concept. The building is designed as a Danish low-energy building, which, together with the integrated energy solution, is something very special and new in China.

The innovative energy concept is designed by COWI to suit the local climate. It is based on information and experience from the Danish Green Light House and is defined broadly so that it includes the building envelope and daylighting, but at the same time minimises direct solar irradiation. The goal is aiming for LEED Gold certification.

### FACTS

› Client:	Nanjing High Technology Economic Development Zone
› Architect:	Archiland International
› Project period:	2012–2015
› Scope:	The total area of Nanjing Lighthouse will be 5,100 m <sup>2</sup>
› Building type:	Offices

### SERVICES

COWI acted as overall project management consultant as well as client advisor and international in-house consultant. Furthermore, COWI did Energy/HVAC schematic building design.

### VALUE CREATION

The Chinese government has increasing focus on the country's growing energy consumption, and the severe problems with air pollution and health issues that follow in its wake. Therefore, the government and a number of local authorities have launched pilot projects to pave the way for a greener urban development with an emphasis on energy savings in buildings. One of these projects is Nanjing Green Lighthouse managed by COWI.



## THE HOUSE OF THE DANISH INDUSTRY FOUNDATION

Beijing, China

The House of the Danish Industry Foundation is located outside Beijing as part of the Graduate University of Chinese Academy of Sciences (GUCAS). The key objective was to establish a bridgehead in Beijing that will give researchers, students, and particularly the Danish business world easier access to the swiftly developing Chinese research world. Apart from 300 postgraduate students, 75 PhD students and 100 researchers from Denmark and China, Danish companies can host business events in the building. The building includes teaching facilities, lecture hall, research facilities, administration, canteen etc. The top level includes 20 residences surrounding an open roof garden, while basement levels is for primarily mechanical and electrical services.

The building was constructed with the greatest possible emphasis on environmentally friendly solutions that comply with the Danish requirements to low energy building class 2015. This implies 33 % lower energy consumption than comparable traditional buildings in Beijing.

### FACTS

- › Client: During preliminary design: The Danish Industry Foundation. After preliminary design: The Danish University and Property Agency.
- › Project period: 2010–2013
- › Architects: Lundgaard and Tranberg Architects
- › Scope: 10,770 m<sup>2</sup> gross floor area
- › Building type: Education

### SERVICES

COWI provided a wide range of services on the project ranging from design management to installations and fire safety.

### VALUE CREATION

Then new building offers space for knowledge-sharing and business. At the same time the design has ensured low running costs and minimised carbon emissions, benefitting people and society.





## SUSTAINABLE TOWN HALL

Viborg, Denmark

COWI has designed the sustainable solutions for the new town hall in Viborg, which will reduce energy consumption by 50 % compared to current Danish requirements. To ensure a sustainable town hall – now and years ahead – a number of renewable energy technologies has been applied in the construction of the building.

The facades are constructed to utilise solar energy for heating in the winter and shield from the heat of the sun in the summer. The town hall has minimised energy consumption by 50 % by installing a heat pump, solar energy panels and thermo-active constructions. Thermo-active constructions are typically tubes or pipes embedded in the concrete of the structural work which regulate the indoor temperature. They have the additional benefit of ensuring a good inner climate. Viborg's town hall has a green roof, also known as a living roof, that covers most of the building. The roof is covered with vegetation and soil planted over a waterproofed membrane. It provides insulation and absorbs rainwater, thus reducing the discharge of rainwater to the sewage system.

### FACTS

› Client:	Viborg Municipality
› Project period:	2008–2011
› Architects:	Henning Larsen Architects and landscape architect Lisbeth Westergaard
› Scope:	20,000 m <sup>2</sup> new town hall
› Building type:	Offices

### SERVICES

COWI acted as specialist advisor in all aspect of engineering.

### VALUE CREATION

The new town hall is the workplace for approximately 800 employees and provide an inspiring and innovative setting for a modern and efficient organisation. The town hall is one of the first Danish office buildings with an energy consumption and running costs 50 % below that of conventional office buildings.



# ØSTFOLD HOSPITAL

Kalnes, Norway

The new Østfold Hospital 100 kilometres southeast of Oslo unites four existing hospitals in the area as well as the psychiatric hospital functions. As a part of the project, the hospital in Moss, approximately ten kilometres north of the new hospital, will be expanded and converted to approximately 24,000 m². COWI is responsible for the planning and design of the new hospital and renovation of the old Moss Hospital.

COWI has been specialist advisor on logistics during the pre-design phase. The logistics analysis outlined potential bottlenecks in the current deign proposals and proposed a new logical structure which would allow for a smoother flow of goods and appropriate sizing of logistical and technical areas.

## FACTS

› Client:	Helse Sør-Øst RHF, Norway
› Project period:	2010–2015
› Architects:	Arkitema, AART and Eliassen and Lambertz-Nilssen Architects A/S
› Landscape:	COWI
› Scope:	Approx. 82,500 m² of new buildings and 24,000 m² refurbishment of Moss Hospital.
› Building type:	Hospital

## SERVICES

COWI provided advice in all disciplines, including project management, logistics planning, construction, geotechnical engineering, plumbing, energy, environment, fire consultancy, acoustics, ventilation, electronics, telecommunications and IT, landscape planning.

## VALUE CREATION

With the design of Østfold Hospital a major step is taken towards developing a ‘health care house’ of the future where design and layout supports patient recovery and wellbeing. The goal of the architecture has been to create a framework of trust where patients, visitors and staff feel highly prioritised.







## ST. OLAV’S HOSPITAL – KNOWLEDGE CENTRE

Trondheim, Norway

The Knowledge Centre at St. Olav’s Hospital in Trondheim is Northern Europe’s first hospital built as passive house. The Knowledge Centre has a relatively compact building structure shaped as a “horseshoe” and provides a central building for research and teaching, containing teaching areas, libraries and auditoriums for the university (the largest seats 350 people) in addition to areas of hospital functions as research laboratories, clinics and wards.

Throughout the project, there has been a high environmental focus. This included emphasis on materials, energy and health and safety conditions. The centre is also a pioneering project on the use of multidisciplinary BIM tool for all subjects and all stages. During the World Congress for health architecture in Toronto, Canada in 2014 St. Olav’s Hospital in Trondheim won seven out of ten awards. For instance, the Knowledge Centre was named best international health project under 40,000 m². The project was also selected as one of the world’s best eco-buildings in 2013, receiving the so-called WAN award for environmental projects – World Architecture News.

### FACTS

› Client:	Helsebygg Midt-Norge
› Project period:	2009–2013
› Architects:	Arsted Architects, Narud Stokke Wiig, and Medplan Architects
› Scope:	The wings are between 3-6 floors and houses the hospital area of 6,900 m² as well as the higher education area of 10,300 m²
› Building type:	Hospital

### SERVICES

COWI had overall responsibility for the consultancy and engineering services including technical design, environmental assessment, energy optimal solutions and materials.

### VALUE CREATION

St. Olav’s Hospital is the first hospital in Norway to completely integrate patient treatment, research and teaching. COWI has provided innovative solutions that includes environmental and energy considerations and anticipates rapid and unpredictable development in diagnostics, treatment, research and medical technology and therefore facilitates a flexible organisation of the operation of the hospital.



## ROYAL OPERA HOUSE

Muscat, Oman

The new Royal Opera House in Muscat is a modern state-of-the-art operatic and concert venue for up to 1,000 visitors. The image of the building draws on traditional Omani features to give a statuesque structure sympathetic to the style of modern Omani public buildings.

COWI along with other sub-consultants provided engineering consultancy for all structures, mechanical & electrical services, fire and life safety and other related disciplines. Advanced simulation tools were used to ensure world-class thermal indoor environment in the Audience of the Royal Opera House, among others by means of CFD simulations. These simulations were used to determine the temperature and air velocities in the Audience and in the areas next to the stage. The 8-hectare site allocated for the theatre in the centre of Muscat was developed as the start of a new urban quarter with a landscaped park, cultural souk (market) with museums, retail shops and a village square.

### FACTS

- › Client: Royal Estate Affairs of Oman
- › Project period: 2007–2011
- › Architect: WATG
- › Scope: 8-hectare site, venue for up to 1,000 visitors
- › Building type: Cultural building

### SERVICES

COWI services included structural design, MEP design, services and systems, construction supervision and indoor environmental simulations by means of Computational Fluid Dynamics (CFD).

### VALUE CREATION

The new Royal Opera House contribute culturally to society upholding the original Omani traditions. It also contributes with outstanding indoor climate for the benefit of people's health.







## THE ROYAL DANISH PLAYHOUSE

Copenhagen, Denmark

Situated on the harbour front in central Copenhagen the Royal Danish Playhouse is a central attraction in the development of the Copenhagen waterfront into a recreational area on a par with cities like London and Amsterdam.

With about 40 % of the building projecting over the water, it was necessary to safeguard the building against ship collisions. Another extraordinary feature is the roof floor of the playhouse where COWI's structural specialists have designed full storey height steel truss girders with total lengths reaching 85 m, and with cantilevered spans as high as 26 m or what amounts to a seven storey building.

Due to the location of the playhouse, the building is using seawater to cool the building, and by connecting a heat pump to the system, the seawater can be utilised optimally – even for heating in spring and autumn.

### FACTS

› Client:	The Danish Ministry of Culture
› Project period:	2002-2008
› Architect:	Lundgaard and Tranberg Architects A/S
› Scope:	A building of approx. 18,000 m <sup>2</sup> . Site area of approx. 21,500 m <sup>2</sup> . Three stages with a seating capacity of approx. 650, 200 and 100
› Building type:	Cultural building

### SERVICES

COWI provided consultancy on all disciplines in the fields of structural, mechanical, electrical and civil engineering services including indoor climate and energy design. Design according to performance based fire requirements and risk management.

### VALUE CREATION

Besides contributing to the creation of a cultural and artistic icon for people, COWI has developed an innovative energy concept for the Royal Danish Playhouse. The energy concept contains e.g. thermal active structures with energy storage, sea water cooling with heat pump and demand-driven ventilation. Savings on electricity consumption for cooling will amount to more than 75 %.



## OSLO AIRPORT GARDERMOEN –TERMINAL 2

Oslo, Norway

Oslo Airport's Terminal 2 in Norway will increase the passenger handling capacity of the airport to 28 million travelers a year. The project was conceptualised in 2007 and in mid-2014 construction works were 50 % completed. The new terminal is scheduled to open in April 2017.

The terminal project also includes upgrades to the roadway system and the redevelopment of the forecourt areas. Being built west of the existing terminal building, the new building will cover an area of 120,000 m<sup>2</sup>. The new triangular-shaped pier called 'Pier B' or 'North Pier' is being built north of the existing terminal building and will cover a floor area of 63,000 m<sup>2</sup>.

The new structures are being constructed with an aim to achieving a BREEAM rating of Excellent. The terminal will use 50 % less energy compared with the existing terminal, and will meet the requirements in the Norwegian Passive house standard.

The project integrates the installation of an innovative snow cooling system. Up to 22,000 m<sup>3</sup> of snow will be collected during winter and stored in an 8,000 m<sup>2</sup> basin at the north of the terminal. The basin will be covered with wood chips for insulation purposes. Waste/sewage generated from the municipality will be used for heating.

### FACTS

- › Client: Oslo Lufthavn AS, Norway
- › Project period: 2009–2017
- › Architects: Narud Stokke Wiig
- › Scope: 120,000 m<sup>2</sup> new building with capacity up to 28 million passengers in the first phase and further to 35 million in a later stage
- › Building type: Airport

### SERVICES

COWI's services include project management and consultancy services on HVAC, IT systems, acoustics, fire strategy, geometry for the airfield, involvement, health & safety, energy, environment and indoor environment.

### VALUE CREATION

The holistic approach has created a logistic functional terminal with good and healthy environment and with low running cost as well as low carbon and toxic emissions.







© Larsen A&amp;CE, Oman

## MUSCAT INTERNATIONAL AIRPORT

Muscat, Oman

The Muscat International Airport development project is the largest project ever undertaken in the history of Oman. It has been designed with a very modernistic approach and with strong locally influenced aesthetics.

The project included a new terminal building, a 103 m high control tower and an Air Traffic Management Centre, 32 air bridges, two runways, a new cargo terminal and 6,000 parking spaces as well as a highway to the airport.

COWI was also responsible for design and procurement of terminal IT systems, baggage sortation system, CCTV, public address systems as well as fire fighting systems.

Special attention was given to reduce the energy consumption of the building, among others by means of a very efficient central district cooling system, very efficient heat recovery for all HVAC plants, tight building envelope, LED and lighting controls. Advanced simulation tools were used to determine the indoor environment.

### FACTS

- › Client: Ministry of Transport and Communications, Oman
- › Project period: 2005–2012
- › Architect: Larsen A&CE, Oman
- › Scope: Net floor area of 340,000 m<sup>2</sup> with capacity for 12 million annual passengers
- › Building type: Airport

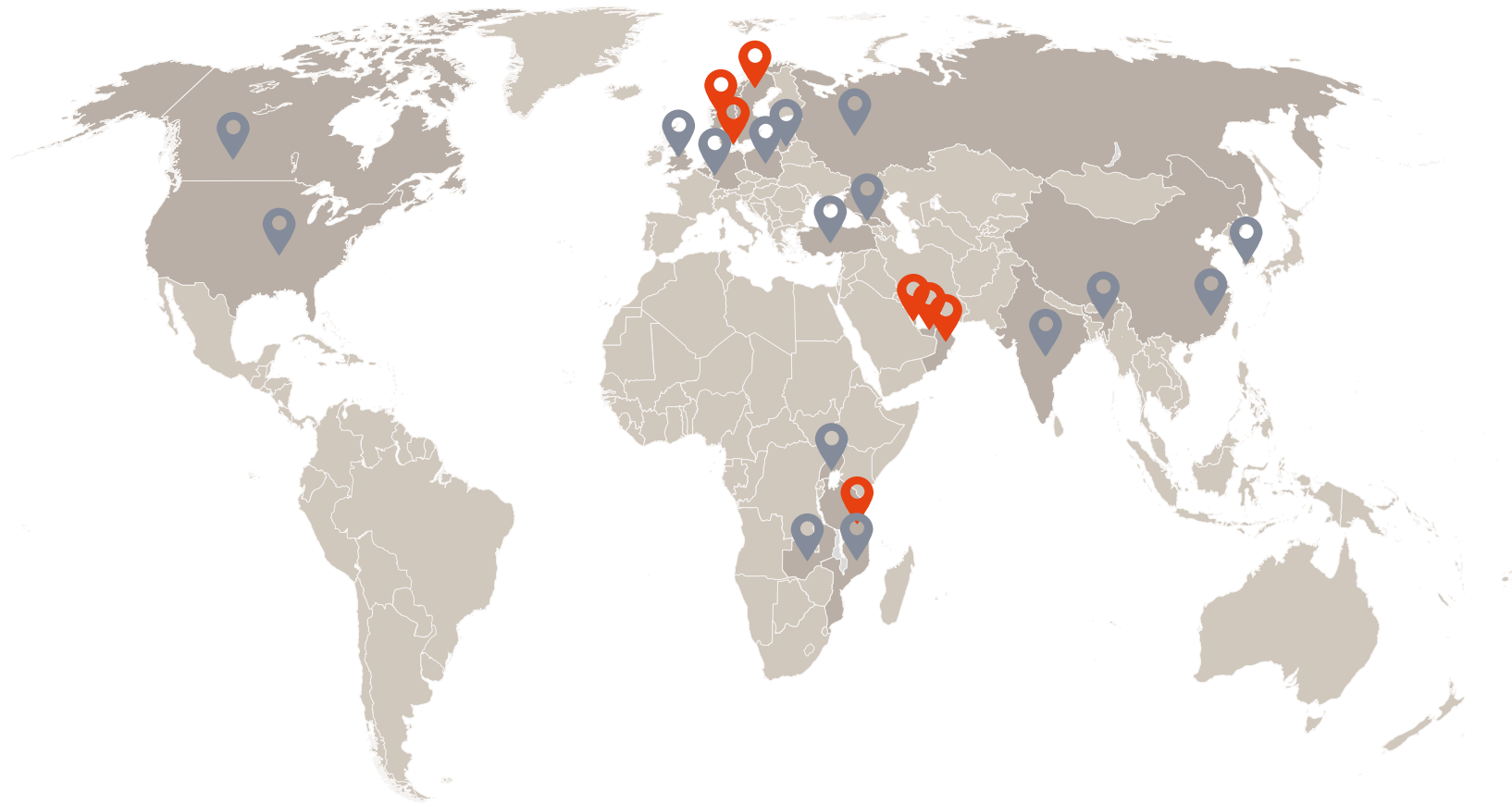
### SERVICES

COWI provided project management, airport planning, environmental assessments and engineering consultancy and design in all disciplines, construction management and supervision, energy design and CFD simulations.

### VALUE CREATION

The airport is not only an attractive architectural building servicing millions of people, it is also a dynamic and functional structure, which has been designed to accommodate future expansion. The airport take into account energy design and indoor climate.





ADDRESS COWI A/S  
Parallelvej 2  
2800 Kongens Lyngby  
Denmark  
PHONE +45 56 40 00 00  
WWW cowi.dk

ADDRESS COWI A/S  
Grenseveien 88  
0605 Oslo  
Norway  
PHONE +47 02694  
WWW cowi.no

ADDRESS COWI AB  
Skärgårdsgatan 1  
S-414 58 Göteborg  
Sweden  
PHONE +46 10-850 10 00  
WWW cowi.se

ADDRESS Reemas Building  
Office MF-10  
Land No 592, Al Quoz 1  
PO Box 52978  
Dubai  
United Arab Emirates  
PHONE +971 4 3397 076  
WWW cowi.com/uae

ADDRESS COWI A/S OMAN  
2<sup>nd</sup> Floor, Bait Mahmiyat Al Qurum  
Way 2601  
Qurum, Muscat  
P.O. Box 2115  
Ruwi  
Oman  
PHONE +968 24604200  
WWW cowi.com/oman

ADDRESS COWI A/S Qatar  
Al Mana Tower, 8th floor  
Suhaim Bin Hamad St.  
C-ring Road, Bin Mahmoud Area  
P.O. Box 23800  
Doha  
Qatar  
PHONE +974 4498 2338 / 39  
WWW cowi.com/qatar

ADDRESS COWI Tanzania  
398 Kawawa Road  
P.O. Box 1007  
Dar es Salaam  
Tanzania  
PHONE +255 22 266 6161  
WWW cowi-africa.com

MEET US AT [www.cowi.com](http://www.cowi.com)

