Infrastructure

Excellence in project delivery across disciplines

NIRAS

NIRAS is an international consultancy company

 Cover photo: Thomas Morkeberg

NIRAS is an international consultancy company founded in 1956 and one of the leading Scandinavian consultants. With our headquarters in Denmark and branch offices in Europe, Asia, North and South America, and Africa, we take part in 7,000 projects in more than 100 countries.

Our services cover the full cycle of a project, from the preparation of master plans, and technical and financial analysis, through design and tendering, to supervision, commissioning, operation and maintenance. Our 2,400 experts offer multidisciplinary specialist knowledge that guarantee holistic solutions.

In NIRAS, sustainability is at the very core of our endeavours and for many years our experts have been at the forefront of providing sustainable solutions in large infrastructure projects.

We have vast experience in the following fields:

- Sustainable mobility
- City planning and landscape
- Railways, metros and light railways
- Roads
- Tunnels
- Bridges and civil structures
- Ports and marine
- Turnkey
- Coastal stabilisation and flood risk management
- Geotechnical engineering
- Environment

This brochure covers some of our references in the past five years and describes our services and expertise.

Sustainable mobility

Sustainable mobility is part of a greener future. Developing and promoting public and active transport is fast becoming a central element in urban planning and in management of countryside living and development.

NIRAS has a team dedicated to sustainable mobility. We have extensive experience in mobility analysis and planning for both public and private clients. All our projects focus on promoting public and active transport and integrating these into the mobility and infrastructure systems that underpin our societies. We work both in urban settings and rural districts, and always focus on the passenger experience.

Our services include:

- Strategic mobility planning
- Mobility hub development
- Mobility behaviour analysis and design
- Crime prevention through urban design
- Analysis of passengers' perception of safety
- Cycling infrastructure analyses and development
- Public and active transport planning
- Traffic planning
- Recreative and tourism mobility analyses and planning

New urban development project with decentralised hubs for micro-mobility

Client: Stigsborg P/S
Country: Denmark
Period: 2021-2022

Services:

- Analysis of demand for micro-mobility hub
- Neighborhood mobility analysis
- Design of specific micro-mobility hubs
- Communication with architects and developers

Stigsborg Waterfront is one of Denmark's largest urban development projects, right on the coast in the city of Aalborg. Full development is expected to be completed in 25 years. The new urban area is projected to become the home for 8,000 inhabitants and to host a wide range of public and private institutions.

In collaboration with architects CF Møller, NIRAS has conducted the traffic analysis and planning for Stigsborg, including the development and design of micro-mobility hubs. These hubs will become the infrastructural backbone of Stigsborg, which aims to minimize car usage within the area, and become a 15-minute neighborhood.

NIRAS prepared a plan for the locations of the micro-mobility hubs, and for what each individual hub should host of various active transport services. Each location is linked to the public transport service in Stigsborg and will thus allow the inhabitants and guests to use sustainable mobility solutions in and around this new urban area.

Illustration - courtesy of CF Møller

Ridership potentials of local train stations

This analysis of local train stations focuses on ways to improve the customer experience and evaluate a station's performance on shelter, traffic information and urban qualities.

Local train stations have the potential to become active hubs in local communities, but this analysis by NIRAS shows a lack of integration of the stations into the urban surroundings. This leads to lack of 'eyes on the street', which influences passengers' perception of safety and thus reducing their willingness to use the station and in turn the train. Furthermore, the analysis shows that the urban planning practice reduces the awareness of public transport as a potential part of everyday life. As part of the analysis NIRAS provided recommendations on how to taylor the commuter experiences to target groups, and to retain and increase the number of passengers using public transport.

Client: Movia
Country: Denmark
Period: 2021-2022
Services:
- Process design
- Situational interviews
- Urban analysis
- Crime prevention analysis

Crime prevention parameters in mobility planning

Client: Albertslund Municipality
Country: Denmark
Period: 2021
Services:
- Situational interviews
- Urban planning analysis
- Crime prevention analysis
- Extensive strategic criminological perspectives for urban planning and development

Albertslund Municipality is undergoing major re-development, including development of new residential areas and upgrading of the town centre. Part of this re-development focusses on public transport becoming the primary transport mode in Albertslund. To achieve this, the main train station will play a prominent role, with a 15 minute direct connection to Copenhagen Central Station. However, Albertslund train station struggles with crime and low perceptions of safety. So to make this a well-functioning transport node, NIRAS conducted an extensive crime prevention analysis which will feed into the municipality's mobility planning strategy.

NIRAS' analysis provided concrete proposals for local plans, streetscapes, flows, paths, roads and tunnels. Furthermore, NIRAS asked 130 local citizens to describe their user experiences in and around the train station, revealing coping strategies, potentials in urban planning and community strength. The insights from the analysis have helped Albertslund Municipality address challenges with crime and low usage at their main train station, allowing them to plan for an urban future where more passengers will be able to use public transport safely.

City planning and landscape

 Photo: Uri Golman

Our city planners and landscape architects cover everything from developing strategies and overall plans to creating concrete urban and landscape spaces. They cooperate closely with other disciplines in NIRAS to create sustainable attractive urban and landscape spaces and to find the best solutions for both environment and people.

We design and project landscapes and urban spaces in relation to infrastructure, institutions, housing, climate adaptation, etc. We do so on the vision that all projects and places are something special and therefore must be treated with care and consideration for the users and for future generations. In the cities, we see a strong connection between urban planning and landscape architecture. From overall strategies to the specific urban spaces, landscape architects collaborate with urban planners and climate specialists, so that the urban space becomes an attractive framework for good urban life.

Odense Light Rail

Client: Odense Letbane P/S

Country: Denmark

Period: 2014-2021

Services:

- Landscape
- Cityplanning
- Infrastructure

The development of the light rail in the city of Odense represented a series of exciting challenges for NIRAS' specialists within rail, city planning and landscape architecture. Odense is a city dating back to the Viking age and the new light rail passes through the very centre of Odense. Therefore, it has been crucial to find a solution that respects the millennial history of the town while also being able to function fully as a modern means of transportation. NIRAS' experts have worked in detail with the positioning of the rail lines and the placement of the stations to secure the best possible visibility, comprehension and usability in the historic city centre. Due to the complexity of the project, it was necessary to make several compromises to strike a balance between the flow of traffic, the economy of both construction and operation, considerations for the neighbours, as well as other factors.

Right from the beginning, the light rail of Odense was designed to be more than just a transportation system. The light rail is a tool that will enhance the urban development and condensation of Odense, both regarding the city proper as well as newer districts.

Furthermore, the light rail will pass the old University Hospital of Odense whose area will be adapted for new purposes. However, there are no concrete plans for the use and layout of this location, so therefore it has been necessary to apply a design that can be modified at a later stage so the former hospital area will be serviced with a high level of public transport.

Østervold, Randers

Client: Vandmiljø Randers (Aquatic Environment Randers) and Randers Municipality

Country: Denmark

Period: 2021

Services:

- Planning & Mobility
- Water

Østervold is a blue-green urban space in the city of Randers that serves both as a recreational area and as a new rainwater basin that cleans the water before it flows into Randers Fjord. In the long run, the basin will function as a climate adaptation of the medieval city. Randers has to deal with a series of water related threats, since the city faces flood risks from both the seaside in the form of storm surges from Randers Fjord, downpours in the higher parts of the city and floods coming from the Guden River which runs through the city. The basin becomes part of a cloudburst channel which can receive large amounts of rainwater and thus prevent flooding.

The rainwater basin at Østervold is one of the first visible parts of the development plan 'Flodbyen Randers' which was launched in 2020. The ambition of the plan is to bring attractive nature and high biodiversity very close to the city while at the same time making sure that urban development considers climate adaptation and storm surge protection.

Due to Randers' specific risk profile regarding floods, the utility company Vandmiljø Randers (Aquatic Environment Randers) and Randers Municipality have started working on the plan 'Flodbyen Randers' (River City Randers) to make sure that water solutions and water risk assessment will form an integral part of all future urban development.

NIRAS has advised Vandmiljø Randers on all the engineering disciplines in connection with the planning and construction of the new blue-green urban space. In addition, the basin is designed by our landscape architects, who have been responsible for the idea, design and planning of the parts of the project that are related to the urban space - including planting, paving and furniture in close collaboration and dialogue with Randers Municipality.

Due to the close interaction between the classical engineering disciplines and the landscape architects, we have found a solution that combines the technical rainwater management solutions with an accessible urban space. The interaction between water and planting draws the beautiful nature around Randers Fjord into the city, and it has given Østervold new energy and has created great recreational value for the inhabitants of Randers.

Railways, metros and light rails

 Photo: Odense Letbane

NIRAS has ample experience with all aspects of projects related to railways, metro and light rails. We have carried out a series of large rail projects in the Nordic countries. Our experts handle all stages of railway projects and have specialised knowledge within all areas of expertise from planning, design and construction.

NIRAS handles all railway project stages, from idea to construction inspection and subsequent operations and maintenance. We cover all technical skills required for planning, designing and constructing railways.

Our services include:

- Railway technology
- Rolling stock and operations
- Traffic planning
- Civil engineering and construction
- Road construction
- Stations
- Environmental impact
- Operational and socioeconomics
- Capacity simulations
- Assistance for tendering on large supply, construction or operating contracts
- Operation and maintenance
- Feasibility studies and business economics

In addition, we handle a range of interdisciplinary tasks, such as interface management, construction cost estimates and risk management, regulatory processing and approvals, and common safety method (CSM) assessment. We often work across disciplines to achieve an optimum solution.

Electrification of railway line and 27 new bridges

Sustainability is the keyword to public transport in many countries. Therefore the Danish railway system is being adapted to electrical trains in order to provide more sustainable mobility in the future. This massive task includes electrification of the railways as well as constructing and refurbishing bridges.

NIRAS has carried out preparation work for the electrification of the 145 km railway line between Aarhus and Lindholm, a new transportation hub near Aalborg in Northern Jutland. The upgrading of the existing railway includes electrification and speed up-grading of the double track exiting railway.

Constructing 27 new bridges

NIRAS services include the construction of 27 new bridges, including both road and pedestrian bridges and the road design of crossing roads and reconstruction of existing roads. In addition, our experts have carried out reconstruction of 6 existing bridges and demolition of 33 bridges that became obsolete. We also executed a survey of existing tracks and terrain, track lowering at 5 locations, and earthing and equipotential bonding of the whole 145 km stretch. Furthermore, we undertook the environment assessment, the design of drainage, and the relocation of existing utilities. NIRAS is responsible for design and build packages, including preparation of tender documents, tender design of 19 new bridges, follow up and evaluation of the received bids during tender period and finally supervision during execution phase.

Client: Atkins Danmark A/S

Country: Denmark

Period: 2016 - Ongoing

Services:

- 27 new bridges including road and pedestrian bridges
- Reconstruction of 6 existing bridges
- Demolition of 33 existing bridges
- Track lowering at 5 locations
- Road design of crossing roads
- Relocation of existing utilities
- Earthing and equipotential bonding of the whole 145 km stretch
- CSM (Common Safety Method)
- Environment assessment
- Design of drainage
- Survey of existing tracks and terrain

Ålsgårde Station modernization of tracks, platforms and drainage

Client: Lokaltog
Country: Denmark
Period: 2019-2021

Services:
- Project management
- Detailed design
- Preparation of tender documents & assistance during tendering process
- Construction supervision and delivery of build documentation
- Track system
- Platforms
- Platform passage
- Drainage system
- Railway safety
- CSM-RA and TSI incl. documentation for AsBo and NoBo
- OHS
- Contractors control plan

Ålsgårde Station is a railway station in the north of Zealand served by the Danish railway company Lokaltog responsible for train operation and related passenger services. NIRAS was involved in all project phases from detailed design to tendering, construction supervision, and delivery of build documentation of a major renovation station. The work also included modernization of the station area, improved access conditions, two new platforms with elevation of platform height, establishing of a track passage warning system, rebuilding of two tracks going through the station with an improved track geometry, and a complete new drainage system.
NIRAS also assisted handling and documenting railway safety based on the Common Safety Method - Risk Assessment (CSM-RA) and Technical Specifications for Interoperability (TSIs).

Ringsted-Femern railway

Client: Banedanmark
Country: Denmark
Period: 2010-ongoing

Services:
- Project management
- Preliminary and detailed design
- Preparation of tender documents & assistance during tendering process
- Tracks and substructure
- Power supply and electrification including SCADA
- Civil works including structures and soil handling
- Drainage including reservoirs
- Crossing roads
- Environmental coordination cf. EIA
- Screening for contaminants

The Femern Belt connection is an 18 km tunnel between Denmark and Germany, and one of the largest infrastructure projects in Danish history. As part of this undertaking, Banedanmark (Danish Rail) is building a new railway that will connect the tunnel with a railway hub in the town of Ringsted.

The 55 km new doubletracks will allow the trains to travel at 200 km/h.

The project also comprises modification of three stations and the replacement of 18 bridges allowing room for electrification as well as a new bascule bridge across the strait of Guldborgssund.

NIRAS has been involved in all project phases from initial planning through to construction supervision and delivery of build documentation. NIRAS' project team was co-located with the client for several years allowing a seamless cooperation and coordination.

Facts:
- 55 km of double track
- Replacement of 18 bridges
- New bascule bridge across Guldborgssund
- Upgrading to 200 km/h

Ski in Norway:
New eastern line and train turning side tracks on Østfoldbanen

Client: Bane NOR
Country: Norway
Period: 2018-ongoing

Services:
- Design basis
- Capacity analysis
- Cost estimates
- Risk analysis
- Railways, tracks and civil works
- Signals
- Structures
- Environment
- Drainage
- Preliminary design
- Detail design

In the eastern part of Norway there is an increased demand for train journeys. In order to deliver improved capacity and frequency, Bane NOR (Norwegian rail) is therefore improving the rail system by adding a new eastern line around the town of Ski south of Oslo.

Furthermore, Bane NOR has also planned additional side tracks for train turning and overnight storage. The side tracks will have capacity for 30 trains. The side tracks will include train wash buildings, service facilities as well as workshops for maintenance of the trains.

The project also includes the preliminary design for the 6 km doubletrack eastern line around Ski. The line is designed for 100 km/h.

Facts:
- Side tracks for 30 trains
- Wash and maintenance facilities
- 6 km new doubletrack between existing western and eastern line

Fixed transmission network

Since 2018, Banedanmark has been in the process of reorganizing and establishing new routes for fiber cables on the Copenhagen suburban S-train lines and on long-distance lines in Denmark.

NIRAS has carried out a preliminary study and detailed design of the route for conduit pipes and associated wells for connection to the track's infrastructure objects for approx. 520 km of railway including underpasses.

Preliminary investigations include section review, acquisition and registration, and digitalisation of bases including line information, as well as implementation of inspection of sections.

Detailed design includes 3D design of conduit pipes, consisting of a pipe block of approx. 10X10 cm with associated wells for assembly of fiber cables or reinforced cable in cable trays located along the above-mentioned line sections in accordance with Banedanmark's requirements and instructions.

The project also includes handling authority requests regarding environment and nature, preparation of geotechnical risk assessments, risk assessment of wetlands, design of a solution for passage of existing structures and other obstacles, working environment and CSM including exemption applications as well as input to landowner agreements and possible expropriation.

NIRAS has also prepared material for contractor tenders for all sections in the main contract. In addition, NIRAS participates during the tendering and handles project follow-up during the execution.

Client: Banedanmark

Country: Denmark

Period: 2017 - ongoing

Services:

- Project management
- Construction work
- Bridges
- Roads
- Constructions
- Stations and platforms
- Geotechnics incl. soft bottom work
- Environment
- Work environment, health and safety
- Construction estimates

Roads

We pave the way for the roads of the future and assist with status evaluations, design of roads and pathways, and land development

Accessibility, safety and sustainability are the keywords, when we work with roads at NIRAS. We design roads in open landscapes through sensitive nature, and we lay out urban streets and areas in a way that optimises space utilisation and creates a safe and attractive environment.

We design safe bicycle and pedestrian paths, and we have expert know-how in assisting municipalities, authorities and utilities companies with status evaluations and tendering of operation of roads, parks and green areas as well as winter services for same. We also have extensive land development experience, addressing and handling all challenges related to climate adaptation, nature, soil, environment, traffic, road and pathway construction, green areas and utility installations.

Norway intercity railway: Sandbukta - Moss- Såstad (SMS 2A)

Client: Bane NOR
Country: Norway
Period: 2022

Services:
- Relocation of existing utilities
- Ground works including jet grouting and deep dry soil mixing
- 3D design of temporary roads
- Drainage design of temporary roads
- 3D design of permanent roads
- Drainage design of permanent roads
- Streetlighting
- 3D design rail works, including sub-structure works

In recent years, NIRAS has gained a solid position within road and railway infrastructure in Norway thanks to our group of experts in different Norwegian cities as well as in Denmark. Due to our different areas of expertise we have been contracted to carry out a series of large, complex road and railway projects in Norway by Bane NOR, the government agency responsible for owning, maintaining, operating and developing the railway network in the country.

One of our latest projects for Bane NOR is the expansion of the railway system in the Moss region Oslo, which also includes a series of road works. The new double track railway Sandbukta-Moss-Såstad (SMS) forms part of the Intercity development in Norway. Due to this project, the frequency will rise to four trains per hour from Moss to Oslo and travel time will be cut from 50 to about 30 minutes. The project shows NIRAS' ability to cooperate across sectors and between engineering disciplines.

5 km of tunnel in challenging terrain
NIRAS will assist in the completion of the major SMS 2A turnkey project for the InterCity line together with Implenia and ACCIONA. The turnkey contract includes 10.3 km of double tracks, 5 km of tunnel and a new station in Moss.

This includes a 2.3 km tunnel from Sandbukta in the north to Moss in the south that will be made using conventional drilling and blasting operation. The areas are characterized by difficult ground conditions with quick clay as well as large depths to the rock. The cross section will be of 130m^2, whereas the width will be of 13.5m and the height of 10.0m. There will be made a 420m long cut and cover section through areas with soft and quick clay.

Design of the infrastructure works
NIRAS is tasked with the design of the infrastructure works for the project. This includes all the road works for temporary and permanent roads as well as the preparation of the rail works up to formation level. The task requires NIRAS to couple the new infrastructure with road network for different clients; i.e. Moss Municipality, Statens vegvesen (the Norwegian Public Roads Administration), and Bane NOR.

E-16 traffic calming Jevnaker City Centre

The main objective of the project is to downgrade the existing E16 through from European road standard to a city street through the Jevnaker City Centre. The project includes total reconstruction of a total of approx. 3 km road section. Furthermore, the project includes traffic safety measures in relation to pedestrians and bicycles along the section and connection to the public road network.

The project includes major upgrading and relocation of road drainage. Services also include geotechnical engineering in relation to filling in the fjord and disciplines such as geology, landscape architecture, external environment etc.

Client: Statens vegvesen (The Norwegian Public Roads Administration)

Country: Norway

Period: 2017 - 2021

Services:

- Roads
- Road marking and signage systems
- Stormwater
- Electricity
- Constructions
- Geotechnics
- Landscape
- Engineering geology

E-39 Aalgaard-Hove - highway centre

In the western part of Norway, Statens vegvesen is engaged in a large infrastructure facility with the purpose of extending the existing E39 highway.

NIRAS is preparing preliminary design and environmental impact assessment (EIA) for Statens vegvesen Region West.

The existing two-lane highway E-39 will be extended to a dual carriageway four-lane highway. The extension comprises a 14.1 km section from Aalgaard to Hove, approximately 20 km south of Stavanger.

Part of the new E39 highway section will be constructed in a new alignment including construction of two tunnels - total length is 5 km.

Client: Statens vegvesen (The Norwegian Public Roads Administration)

Country: Norway

Period: 2015 - Ongoing

Services:

- Project management
- Preliminary studies related to nature diversity and geotechnics
- Highway engineering and traffic engineering
- Bridge engineering inclusive expansion joints and bridge bearings
- Tunnel engineering
- Drainage engineering
- Noise evaluation
- Environmental assessment
- Approval by the authorities
- Geotechnics
- Geology
- Electricity – i.a. power supply installations and lighting engineering
- Landscaping and bridge esthetical layout
- Risk management
- Estimated construction costs

Tunnels

 Photo: Jon Nordahl

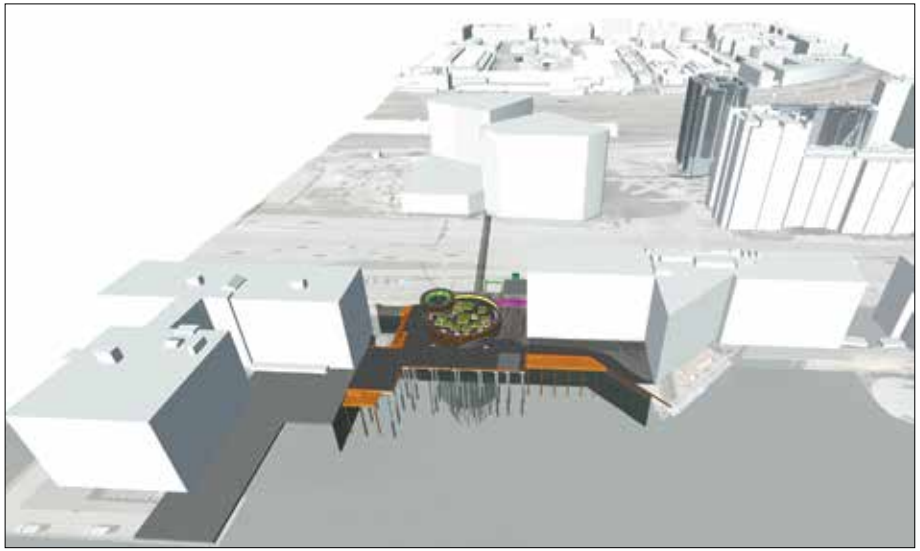
NIRAS is one of Scandinavia's leading consulting engineering companies at the forefront of complex tunnelling & underground engineering challenges.

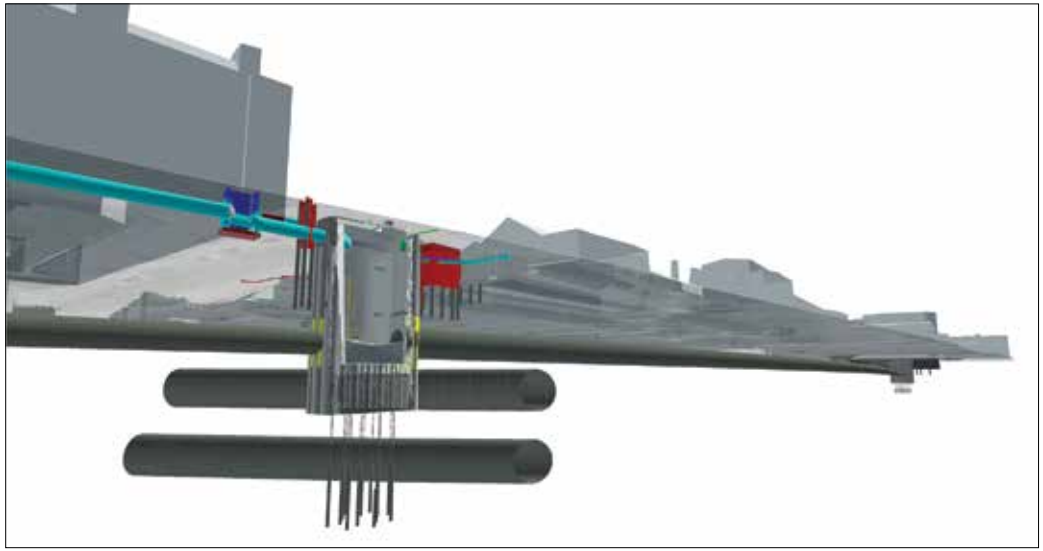
NIRAS has a long history of delivering successfully tunnelling infrastructure projects. Through the last decade, NIRAS has delivered tunnelling projects in Denmark, Sweden, Norway and Thailand, and has established a broad level of expertise in segmental lining, pipe jacking, pipe roofing, pedestrian underpasses, deep shafts and underground structures.

Key to success in all tunnelling projects is the inter-disciplinary coordination, where NIRAS is uniquely positioned to provide a comprehensive range of services by utilizing virtual design and construction tools.

From inception to operation, NIRAS' holistic design approach has assisted our project owners, developers and contractors, to receive an integrated and cost-effective design solution. Our in-house specialists cover a vast spectrum of tunnel related services including:

- Concept design to detailed design
- Tender documentation
- Alignment feasibility studies
- TBM selection (mechanized tunnelling)
- Instrumentation & monitoring
- Settlement prediction analysis
- Construction impact assessment
- Tunnel construction logistics
- Construction time schedule
- Cost estimate
- Risk assessment





Kalvebod Brygge cloudburst tunnel

In 2011, Copenhagen witnessed an unprecedented cloudburst that flooded large parts of the city and caused damages for approximately 500-800 million USD. Due to climate change, these events of extreme weather are expected more frequently in years to come.
Consequently, HOFOR (Greater Copenhagen Utility) has undertaken the construction of a number of cloudburst tunnels in the underground of Copenhagen, which will protect the Danish capital against floods. One of these tunnels is Kalvebod Brygge cloudburst tunnel.

Challenging alignment

The alignment of the tunnel has been highly challenging, since it is located in the heart of the capital and is crossing a number of sensitive assets including a historical theatre, a series of metro tunnels, the tracks of Copenhagen Central Station, etc.
In the event of massive cloudbursts, this underground tunnel will lead the rainwater to a large pumping station which will subsequently pump the water into Copenhagen harbour. The pumping station will be equipped with six powerful pumps which will yield a capacity of 20 m^3 of water per second.

The total cost of construction will be approximately 52 million USD for Kalvebod Brygge cloudburst tunnel.
The Kalvebod Brygge tunnel is part of a wider climate resilience programme in Copenhagen, and it will have a capacity to discharge up to 20.4 m^3/s of flows to the harbour during peak storm events.

Facts:

- Service life 100 years
- Tunnel ID 2,400mm & 3,000mm
- Tunnel total length 1,625m
- Three shafts
- Two connecting structures
- Pump shaft flow capacity of 20.4 m^3/s

Client: HOFOR A/S

Country: Denmark

Period: 2017-ongoing

Services:

- Preliminary and detailed design
- Preparation of tender documents and assistance during tendering process
- Interdisciplinary design coordination
- Interfaces and stakeholder management
- Construction time schedule
- Cost estimate
- Risk management
- Environmental assessment (EIA) incl. Natura 2000
- Noise and traffic evaluation
- Geotechnical and environmental investigations and assessments

Valby cloudburst tunnel

Photo: Jon Nordahl

Client: HOFOR A/S

Country: Denmark

Period: 2017-ongoing

Services:

- Preliminary and detailed design
- Preparation of tender documents and assistance during tendering process
- Interdisciplinary design coordination
- Interfaces and stakeholder management
- Construction time schedule
- Cost estimate
- Risk management
- Environmental Assessment (EIA)
- Evaluations of noise, vibrations and traffic
- Geotechnical and environmental investigations and assessments

The Valby cloudburst tunnel is part of a wider climate resilience programme of infratstructure works in Copenhagen that HOFOR (Greater Copenhagen Utility) is implementing with the assistance of NIRAS and other engineering companies and contractors.

The purpose of the tunnel is to divert the excess rainwater from the cloudburst catchment in the areas of Valby and Frederiksberg in the western part of Copenhagen. The Valby tunnel will be part of the "Den Urbane Strøm" (The Ubran Stream) which will run north-south from Lindevangsparken in Frederiksberg to the outlet in the sea at Kalveboderne.

In addition to handling cloudburst water in relation to over-flows to the recipient, the tunnel will also be used as a pool line to reduce the number of overflows during everyday rain which will also contribute to cleaner sea water.

Facts:

- Service life 100 years
- Tunnel ID 3,400mm
- Tunnel total length 2,500m with a long tunnel drive of approximately 1,300m
- Four shafts
- Microtunnelling connection Ø1,000mm with a length of 203m

One Bangkok linkage to MRT

Client: NAWARAT Construction
Country: Thailand
Period: 2019-2020

Services:
- Detailed design and issued for construction documentation and drawings
- Instrumentation and monitoring
- Permitting and coordination with MRT Metro and Road Authorities

One Bangkok is a Bt120-billion (DKK26.7-billion) landmark development and the largest private-sector property development initiative ever undertaken in Thailand. NIRAS together with NAWARAT Construction have been assigned to deliver, under a Design & Built contract, the pedestrian underpass which will be connecting One Bangkok development with Lumpini MRT Station under one of Bangkok's most busy roads, Rama IV.

During tunnelling operations, the 9 lane road sitting directly above the tunnel would have to remain fully operational, hence the "pipe roofing" construction methodology with interlocked steel hollow sections would be implemented to reduce any adverse effects on underground utilities and ground surface activities.

Facts:
- Pedestrian underpass 71.0m long and 20.6m wide
- Permanent diaphragm walls for the cut & cover section
- Pipe roofing methodology comprising 46 CHS of 36.0m length
- Underpinning existing operational concrete culvert for wastewater

The company participated in the construction supervision, as part of NIRAS advisory services for this Design & Build project.

Källby – Sjölunda deep gravity wastewater system

The Källby to Sjölunda tunnel is part of a large wastewater upgrade program which is intended to take wastewater flows from Lund together with flows from several communities between Lund and Malmö to the main wastewater treatment plant at Sjölunda. The wastewater tunnel has a total length of 10.5 km and it is planned to be excavated mechanically with pipe jacking method using micro TBM technology.

Facts:

- Service life 100 years
- Tunnel ID 3,000mm
- Tunnel total length ~10.5 km
- Nine TBM launching & receiving shafts

Client: VA SYD

Country: Sweden

Period: 2019-ongoing

Services:

- Planning
- Preliminary design & preparation of tender documents
- Construction logistics
- Construction impact assessment
- Construction time schedule
- Cost estimate
- Risk management

Bridges and civil structures

Our specialists assist with planning and design of new bridges, marine installations and tunnels and the renovation of steel and concrete structures.

We work with railway, road, and footpath bridges as well as bridge structures for industrial and marine installations. We specialise in tunnels and other subterranean installations, and tunnelling is one of our primary areas of expertise.

In order to guarantee design quality, we combine advanced 3D Finite Element programmes with calculation modules developed in-house, and we frequently engage with experts from the fields of railroads, drainage, roads, traffic, environment, and geotechnology.

We also assist with the renovation of steel and concrete bridges and structures, and with the planning and managing of demolition once installations have reached their end-of-life.

Lille Langebro

Copenhagen is by many considered the world capital of cycling and bicycles form an integral part of daily transportation in the Danish capital. But the thousands of cyclists in the city also call for innovative and sustainable infrastructure solutions.

NIRAS designed a new bridge for bicyclists and pedestrians called Lille Langebro, which has up to 10,500 users daily. The beautiful new bridge relieves traffic from nearby bridges and connects historical parts of the old city centre.
Ambitions for the project were to create a wider variety for active city life and recreation for the residents of Copenhagen and to establish another essential connection across the water. It is part of Copenhagen's ambition of becoming a green and sustainable city where cyclists are thriving.
The turning bridge is a gift from Realdania and designed by Wilkinson Eyre Architects. It was estimated that the new bridge would get 6,000 – 10,500 users on a daily base. NIRAS participated in the preparation phase of the bridge, which had two compartments that open allowing ships to pass by. The bridge is 5.4 meter high and 20 meters long.

- The new bridge is to relief Langebro, which is used by approximately 35,000 cyclists on weekdays
- Between 6,000 and 10,500 users are expected on a daily base
- Copenhagen has approximately 359 km of bicycle lanes
- There are 650,000 bicycles in Copenhagen
- 1.27 million km is cycled in Copenhagen on a daily base

Client: Realdania / Municipality of Copenhagen

Country: Denmark

Period: 2015-2019

Services:

- Assisting project management
- Geotechnics
- Foundation and support systems of the bridge
- Traffic coordination during the built
- Tender materials
- Contact with authorities
- Working environment coordinations
- Noise and vibrations as well as cable placement

Sluseholmen bridges

Client: HOFOR A/S

Country: Denmark

Period: 2017-2020

Services:

- Project management
- Authority coordination
- Stakeholder management
- CSM risk management (Common Safety Methods) in relation to Banedanmark and Sund & Bælt
- Utilities incl. coordination with utility owners and design of lighting
- Design of road incl. pavement, design of traffic planning, design of bridges
- Design of channels, soil handling, tender and supervision

Tradition and modernity meet in the southern part of Copenhagen where a whole new channel city, Sluseholmen, is being constructed, following the well-known Dutch model of combining pleasant channels and small islets. The channel islets are connected by slender steel bridges for cyclists and pedestrians, allowing inhabitants and visitors to move around the area freely, and thereby creating both dynamic and intimate urban spaces.

NIRAS has designed and supervised 15 independent pedestrian bridges in steel, and designed all the channels in Sluseholmen. In addition, we have designed three combined road and pedestrian bridges in concrete that ensures the connection between the residential area and the access road leading to the rest of city.

The project has also included an upgrade of the utilities in the residential area. These have been incorporated below the access road, involving a lot of utility restructuring in a very limited space.

As project and design manager, NIRAS has prepared draft, authority and retail project for the three bridges and the road in close collaboration with landscape architect Kragh & Berglund.

In addition to the road and bridge project, NIRAS has designed the utility system for the entire area. The project requires extensive communication with authorities and interdisciplinary collaboration, both internally in NIRAS and externally with architect and contractor.

Tower stands for the Akita Wind Turbine Farm

Client: KAJIMA Corporation

Country: Japan

Period: 2020-2021

Services:

- The dominating design forces are wind loads and seismic action
- Structural calculation was done in the FEM software Robot Structural Analysis from Autodesk with Shell-elements and volumetric elements

KAJIMA Corporation in Japan has chosen NIRAS for the design and calculation of tower stands for the preparation of wind turbine towers for the Akita Offshore Wind Farm.

Akita Offshore Wind Farm is one of the first offshore wind turbine farms in Japan and will in combination with the Noshiro Offshore Wind Farm have a capacity of approximately 140 MW.

Tower stands are used during the preparation of the wind turbine towers. The tower stands are typically a 1-2 meter high steel structure, whose purpose it is to distribute forces from the tower to the concrete foundation.

The towers are erected in vertical position and the major part of outfitting is done onshore prior to transportation to the installation site at sea. For this purpose a number of tower stands are positioned on the quay.

Since Japan is in an region prone to both typhoons and earthquakes, it is crucial that the calculations take a series of extreme events into account. The project is executed in collaboration between our highly experienced experts in Taiwan, Bangkok and Denmark.

NIRAS has carried out a series of offshore wind project in Asia in places such as Taiwan and Vietnam, and in recent years we have strengthened our ties with the growing offshore wind industry in Japan.

Ports and marine

NIRAS carries out ports and marine projects worldwide in a variety of conditions - from the Arctic to the tropics.

We have more than 300 experts involved in ports and marine structure projects all over the world. Our experts are based in our offices in Denmark and in different locations around the globe. Our expertise covers all phases of project cycles – from embryonic planning to life-cycle care and maintenance, and all stages in between.

NIRAS provides comprehensive consulting services in relation to port terminals, coastal and marine civil works.

Services are rendered for all project phases including master planning, feasibility studies, input to environmental impact assessments (EIAs), consent, due diligence, design, construction supervision and project management. Along with our traditional consultancy services, we provide multi-disciplinary planning and engineering consultancy services to port operators, owners and authorities wanting to realise the potential of smart and green technology in their ports and terminals. We provide our clients with access to world class expertise in the development of smart and green technology, which varies from specialist providers of port equipment, such as smart electronic plant, to unique services such as laser scanning of port structures.

NIRAS is as the forefront of whole lifecycle management of marine assets, providing innovative inspection and maintenance services through the use of the latest technology. We develop tailored Digital Asset Management programmes and systems to assist ports and terminals with their ongoing operational maintenance and asset management processes.

Expansion of Port of Rønne, Stages 1 & 2

Client: Rønne Havn A/S
Country: Denmark
Period: 2016 - 2022

Services:
- Interdisciplinary clients consultancy
- Calculations of port structures
- Application for permits with relevant authorities
- Local development plans
- EIA
- Project design
- Consultancy on invitation to tender and preparation of tender documents
- Geotechnical and environmental investigations
- Navigation conditions
- Metocean studies
- Numerical simulations and load studies etc.

As an important part of securing a continuous supply to the community of Bornholm, the Port of Rønne is currently expanding in order to futureproof the port facilities and to accommodate port calls from the increasing ship sizes.

As client advisor (in collaboration with the legal advisor of the port), NIRAS has prepared the tender material for expansion stages 1 and 2, which was subsequently sent to EU tender as turnkey contracts.

Stage 1 consist of a 300m long multifunctional quay and approximately 270m of heavy duty offloading quay. Both quays are designed for an initial alongside depth of 11m, with future provision for 13m. 15ha of reclaimed land was established as a yard to support the quays. The reclaimed land is protected from the south by a 510m permanent revetment. For the overall protection of the new port basin, a new 750m breakwater was constructed. The harbour entrance was excavated to a water depth of 11m.

Stage 2 consists of a 400m extension to the breakwater and a new 300m heavy duty extension of the multifunctional quay established in Stage 1, and approximately 5ha of new port area intended for heavy loads.
In collaboration with Port of Rønne and the municipality, NIRAS has prepared the local

area development plans, prepared an EIA as part of application works as well as completed the necessary preliminary investigations. These have included environmental and geotechnical investigations, noise simulations, wave simulations, current and sediment conditions, and extensive Metocean studies. The studies create an exact basis for further planning of the port expansion.

Data from the completed Metocean studies has been used to define the necessary crest level and quay levels accounting for the wishes of Port of Rønne to secure the port against a changing climate.

As the client advisor, NIRAS has been in charge of preparing the project design with associated construction cost estimates, guidelines for the application process in order to obtain the necessary permits from the authorities and tenders for turnkey contracts according to EU legislation. Furthermore, NIRAS was responsible for construction management as the client's representative during the subsequent detailed design and construction phases.

In parallel with the consultancy of the port expansion Stages 1 and 2, NIRAS has assisted Port of Rønne with load studies of existing quays and yard areas. Investigations have especially been made within the offshore wind industry, as the Port of Rønne operates as an assembly port for the loadout of wind turbines within the Baltic Sea.

Relocation of Kipevu Oil Terminal, Mombasa

The Port of Mombasa is the main entry point for all cargo not only for Kenya, but also for the land locked countries in the region – Uganda, Burundi, Rwanda and Eastern part of DR Congo. Import of refined oil products has increased in recent years and the capacity of the existing oil terminal has become too small. Consequently a new terminal was needed. The project includes design of a large new island liquid bulk terminal with four berths, which replaces the existing Kipevu Oil Terminal.

Kenya Ports Authority decided to assign NIRAS to assist in identifying and implementing a replacement. The project includes berthing and mooring facilities for four berths for up to 170,000 dwt oil tankers, pile supported concrete platforms, fitting with marine loading arms, oil piping installations, supplies, sewerage, water, power, lighting, onshore piping, sub-sea piping, and dredging of 15 million m^3 for tuning basins and berthing areas.

NIRAS performs consultancy services related to preparation of preliminary design and tender design, including design, preparation of tender documents for an EPC tender and further preparation of tender documents for geotechnical investigations and bathymetric soundings. NIRAS' work also includes further client consultancy and coordination of external stakeholders in cooperation with the client. The services include construction management (2019 to 2022), as well as preparation of environmental scoping and specification for EIA.

Client: Kenya Ports Authority
Country: Kenya
Period: 2014 - 2022

Services:
- Planning and feasibility study
- Preliminary design
- Preparation of environmental scoping and specification for EIA
- Front-end engineering design
- Preparation of tender documents for EPC Contracting
- Review of EPC Contractor deliverables
- Construction Management

International Port Development

The capital of The Maldives is Malé, which is an island with a population of over 140,000 people in barely more than 2 km^2. The existing port of Male is the primary port in the Maldives and is used as the hub for the importation of container, bulk and general cargo to serve the local population as well as the numerous resort islands in the country.

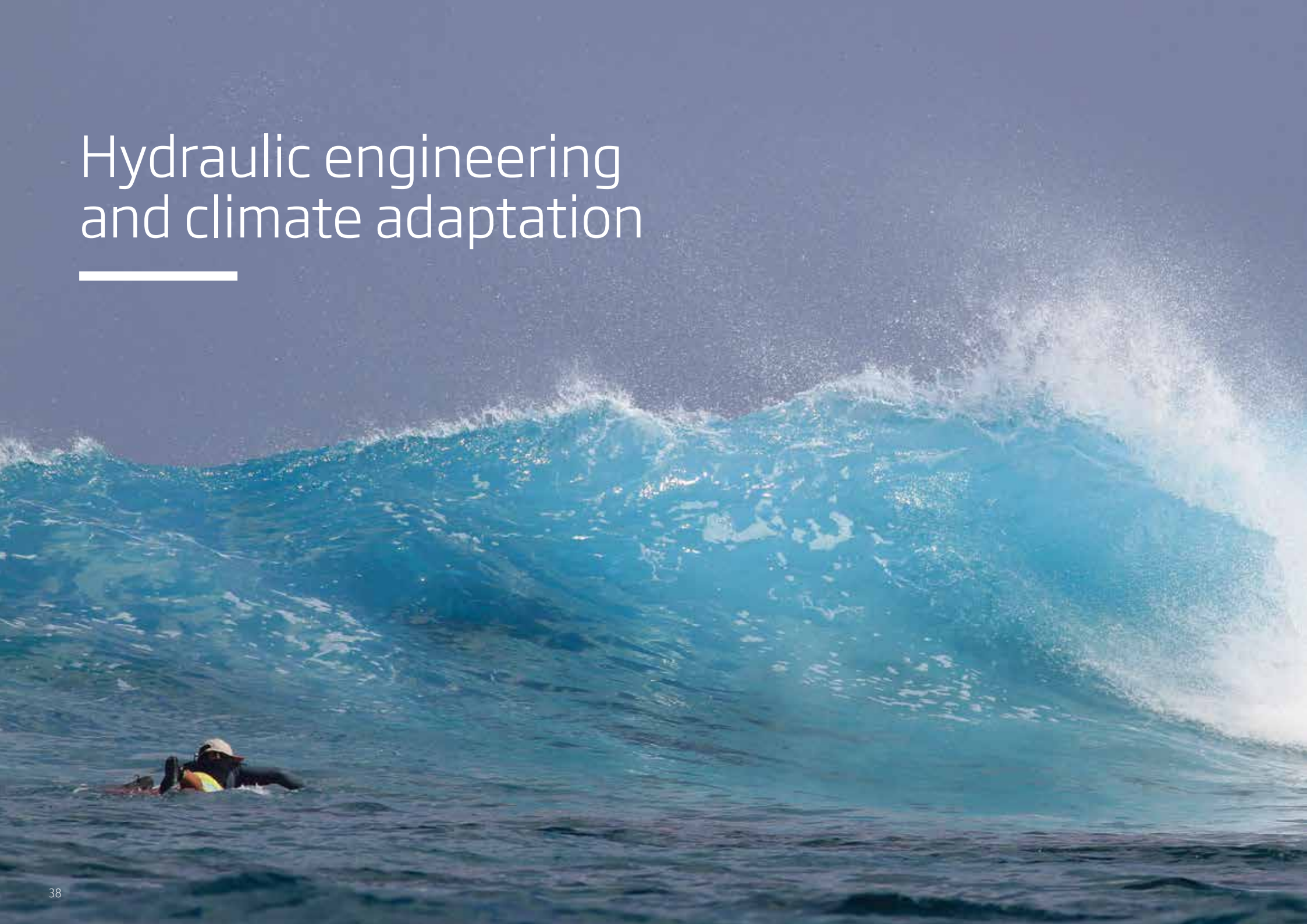
The current port is surrounded by rapid urban development which renders any expansion impossible. As such NIRAS in partnership with MTBS and local consultants led the development of an ambitious project to relocate the primary international port to a new reclaimed island.

The scope of works includes masterplanning the new island and port, surveys and modelling detailed design of land reclamation and shore protection, EIA, EPC tender design for the port, production of tender documents, assistance during the EPC tender period and preparation of management and training plans for the completed port. Sustainability was at the core of the design as well as provision to future expansion.

Client: Government of Maldives
Country: Maldives
Period: 2019-2022

Services:
- Masterplanning & feasibility
- Surveys and modelling
- EPC & detailed design
- Preparation of tender documents
- Tender assistance
- Port operation strategy

Hydraulic engineering and climate adaptation



NIRAS has extensive experience with all aspects of projects related to coasts, climate change, and offshore structures. We have carried out a series of large coastal and offshore projects in Denmark and around the world.

Our experts handle all stages of these projects. They have specialized knowledge within all areas of expertise, ranging from survey and analysis to planning, design and construction. NIRAS has established a broad level of experience in coastal and offshore engineering through many integrated coastal and offshore projects that we have implemented across the world. This is a complex discipline that requires extensive theoretical knowledge and genuine practical experience. Additionally, coastal and offshore engineering projects are often multidisciplinary and concern several stakeholders, making it crucial to successfully manage and combine all interfaces involved.

NIRAS stresses the importance of establishing a fundamental understanding of the natural environment and local conditions when developing sustainable solutions. We hold state-of-the-art numerical models (MIKE-software and CFD-models), GIS and 3D CAD software, which enable us to assist our clients in managing and monitoring the coastal environment as well as developing, optimizing and presenting our assessments and designs.
Our in-house specialists cover all required disciplines and have decades of experience in solving complex coastal and offshore challenges, including:

- Numerical modelling of waves, water levels and sediment transport
- Site and structure assessments
- Shoreline management plans
- Climate adaptation plans for coastal zones
- Coastal and marine structures
- Flood protection
- Integrated coastal zone management
- Sedimentation of accesses channels to ports and estuaries
- Dredging, reclamation and beach nourishment
- Coastal and waterfront development
- Environmental modelling
- Environmental impact assessment
- Risk assessment
- Cost-benefit analysis
- Concept design and detailed design
- Tender documents and tendering
- Contract management and site supervision

Future of the North Coast of Zealand - Shoreline management plan and EIA

The North Coast of Zealand, Denmark, erodes along most of the stretch between Hundested and Elsinore due to a general deficit in the sediment budget.
Over the past 100 years extensive hard coastal protection has been constructed along more than half of the 60 km coast. The coastal and shore protection structures help protect the properties along the beach, but they cannot mitigate the ongoing erosion problem.

Despite having hard coastal and shore protection along the coast, the erosion continues in front of these structures which leads to gradually undermining them as the water depth increases.

NIRAS is developing a long-term sustainable shoreline management plan for the entire 60 km coast for the three municipalities - Halsnæs, Gribskov and Elsinore.

The study is based on extensive numerical modelling of waves, water levels, and sediment transport as well as extensive field surveys.

The shoreline management plan primarily concerns large scale regionally coordinated beach nourishment at threatened properties. The nourishment scheme includes approximately 35 km of beach in total and covers all three municipalities.

The nourishment strategy includes initial beach nourishment and maintenance nourishment at yearly intervals.

The beach nourishment will protect the existing coastal and shore protection structures and properties increasing the durability of the scheme. Additionally, the scheme extends the sandy beaches and hereby providing access along the coast and increases the recreational value of the coast.

The conditions of the existing hard coastal and shore protection structures (approx. 800) are assessed based on a series of scenarios excluding and including beach nourishment in order to optimize the nourishment scheme and protect the threatened properties at present and for the next 50 years.

Revetments and beach nourishment are included in a cost-effectiveness analysis to assess the total cost of the proposed coastal protection scheme compared to the present management strategy applying hard coastal protection only for the 50 year design life of the project.

The shoreline management plan forms the basic guidelines for authorities future evaluation of applications from private plot owners for additional and strengthened hard coastal and shore protection structures.

The shoreline management plan defines standard cross sections for revetments and beach breakwaters that are optimized according to the beach nourishment scheme. NIRAS has prepared a full EIA for the beach nourishment scheme.

Client: Gribskov Municipality
Country: Denmark
Period: 2017 - 2025

Services:

- Site investigations – survey of beach and nearshore seabed. Assessment of existing coastal and shore protection structures.
- Shoreline management plan and concept design of beach nourishment scheme and coastal and shore protection structures.
- Environmental assessment (EIA) and environmental scooping report.
- Cost-effectiveness analysis of applying different coastal protection strategies.

ICZM plan for the North Coast of Egypt

The Enhancing Climate Change Adaptation in the North Coast and Nile Delta Regions in Egypt Project (ECCADP) aims at supporting the adaptation efforts of Egypt in the North coast and in particular Nile Delta. The delta is identified by the Intergovernmental Panel on Climate Change (IPCC) in its Fourth Assessment Report as one of the world's three extremely vulnerable deltas in the world.

The objective of the ECCADP is to reduce coastal flooding risks in Egypt's North Coast due to the combination of projected sea level rise and more frequent and intense extreme storm events.

Output 1 focuses on constructing 69 km of sand dune dikes at five vulnerable hotspots within the Nile Delta that were identified during an engineering scoping assessment and technical feasibility study.

Output 2 focuses on the development of a climate resilient Integrated Coastal Zone Management (ICZM) plan for the entire North Coast of Egypt, to manage long-term risks including climate change.

The ECCADP will facilitate transformational change in the short-term by reducing coastal flooding threats along vulnerable hotspots in the delta and in the long-term by integrating additional risks of climate change into coastal management and planning, budgeting and implementation of risk reduction measures. The ECCADP is implemented by the Ministry of Water Resources and Irrigation (MWRI) and is jointly funded by the Government of Egypt (GoE), the Green Climate Fund (GCF) and the United Nations Development Programme (UNDP).

Client: UNDP Egypt
Country: Egypt
Period: 2021 - 2024
Services:
- Regulatory handling by the authorities
- Project administration
- Pilot project design

Reclamation of three islands, Tourist Resort

The client is a world renowned resort operator with several resorts in the Maldives and elsewhere in the Asian region. The client has drawn up plans for three artificial islands to be reclaimed in the archipelago.
The three islands shall cater for different themes and clientele.

NIRAS was assigned to execute the planning and design of the three artificial islands as well as preparation of tender documents for international competitive bidding. Extensive hydraulic modelling was carried out to model the reclamation and the beaches – with the objective to minimise maintenance replenishment of the beaches.

The retaining structures include groynes and revetments – retaining the 1.8 million m^3 of dredged sand. Construction started autumn 2019 and was supervised by NIRAS' team on site.

The reclamation project adds to the long list of projects NIRAS has carried out in the Maldives over a period of 25 years.

Client: Centara Maldives Private Limited

Country: Maldives

Period: 2016 - 2021

Services:

- Pre-feasibility study
- Preliminary design
- Detailed design
- Tender phase
- Site supervision

Climate Change Vulnerability and Risk Assessment

The beaches and the physical infrastructure of the hotels along the 1 km long Kololi Beach are highly exposed and vulnerable to the weather and climate induced hazards causing an annual erosion moving the shoreline 0.5 to 1 m landwards every year.

To mitigate this erosion a coastal protection scheme was developed by NIRAS in 2015. It consists of 1 km long revetment, 4 detached beach breakwaters and 75,000 m^3 of sand beach nourishment. The revetment was finished in 2019. However, the remaining part of the protection is still pending on available funding.

With the implementation of the shores are protected against further erosion, the width of the beach extended and the risk of physical impact on the properties diminished.

The scope of the present project is to conduct a Vulnerability and Risk Assessment of the impact of the coastal protection scheme along Kololi Beach and adjacent beaches due to climate changes – a Climate Change Vulnerability and Risk Assessment (CVRA).

The project began with an Inception phase where various stakeholders met and information about the coast line and areas of interest were obtained particularly in the impact zone.

As part of the CVRA numerical modelling is undertaken to assess the physical impacts from the climate changes along the project area. The physical impacts are mainly changes in erosion and accretion along the shoreline. Both the scenario without coastal protection along Kololi Beach and with the coastal protection are investigated. The analysis takes the changes in wave climate into account.

An initial assessment was carried out to analyze the social and economic consequences for the hotel owners, employees and their families in relation to the two scenarios with and without coastal protection.

The main conclusions were:
As a consequence of the coastal protection an erosion of the adjacent shore-line to the south in front of Bijilo Forest Park is expected taking place over time. This will reduce the park area with 4 % and 6 % of the entire part area in 2050 and 2075, respectively.

After the design of the coastal protection a Conference Hall has been constructed south of Kololi Beach. The leeside erosion will be significant in front of the International Conference Hall. This can be avoided by extending the southern breakwater or adding an additional breakwater and increasing the initial and maintenance nourishment to the maintenance programme for the coastal protection.

The fully implemented coastal protection combined with an annual sand nourishment in the order of 3-6,000 m^3 will secure the wider beach and umbrella areas in front the hotel. Thus, the most important attractions for the tourist to spend their holidays in Gambia is secured the next 60 years. This will establish a safe economic background for further tourist investment and development in the area.

Client: UNDP
Country: Gambia
Period: 2019 - 2020

Services:
- Coastal engineering
- Numerical modelling
- Vulnerability and risk assessment
- Sustainable solutions
- Stakeholders' meetings
- Social and Economic Impact Assessment

Geotechnical engineering

NIRAS geotechnical experts provide profound knowledge of soil conditions and soil-structure interaction.

Correct understanding of ground conditions is paramount for a successful project execution.

NIRAS stresses the importance of establishing a fundamental understanding of project and ground conditions when developing sustainable solutions.

We offer comprehensive geotechnical services ranging from planning, execution and reporting of geotechnical surveys, including handling and presentation of extensive geotechnical data. This provides a sound foundation for design of infrastructure projects.

Our geotechnical design appreciates the complex interaction between structure and surroundings both during construction and service.

NIRAS holds state-of-the-art numerical modelling tools and has developed software tools that enable us in assisting our clients with geotechnical engineering.

Our expertise is gained through experience from design of large infrastructure like railways, roads, tunnels, bridges, embankments, ports and offshore installations all over the world.

NIRAS has the expertise to design geotechnical structures in challenging soil conditions such as piled supports in sloping soft marine clay or construction of foundations in excavated in Norwegian quick clay to mention a few.

Hillerød Motorway

The project upgrades the final stretch towards Hillerød from road to motorway, thus improving safety and mobility connecting Copenhagen and Hillerød.

Comprising of around 180 new geotechnical boreholes along the 13.2 km alignment (accumulating to a total of 2 km boreholes), the Hillerød Motorway geotechnical investigation is a leading example of a large infrastructure project.

The geotechnical investigation offers synergy with the design project which is also executed by NIRAS.

Client: VD (Danish Road Directorate)

Country: Denmark

Period: June 2022 - ongoing

Services:

- Project management
- Coordination with landowners
- Localization of underground utilities
- Planning, execution and reporting of geotechnical investigation
- Digitalization of existing geotechnical data
- Traffic safety
- Interface with design project

Universitetsstien (bicycle path)

The scope of the project is to improve the connection between University of Roskilde and the city center of Roskilde for cyclists and pedestrians.

The path runs 600 m along the railway, which required deep piled foundation of a steel bridge carrying the path over a road.

The vicinity of the railway to the cycle path and the tight spatial conditions led to a highly complex project, both during design and execution with the railway remaining in service.

Client: Municipality of Roskilde

Country: Denmark

Period: 2016 – 2021

Services:

- Project management
- Coordination with landowners
- Design of steel bridge and piled foundation
- Design of retaining wall
- Risk assessment according to the requirements of Banedanmark (The Danish rail authority)
- Extensive geotechnical supervision

Digitalization in geotechnical engineering

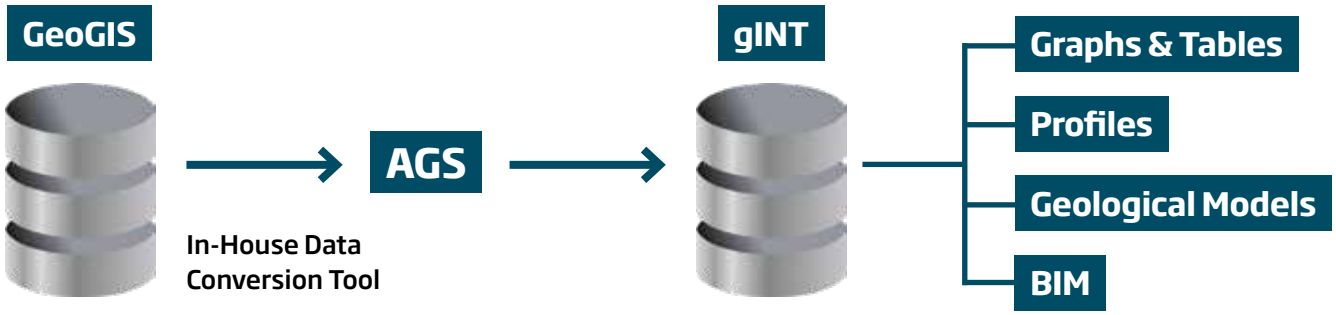
Larger, more complex projects and increasing use of automated data logging for collection of geotechnical, hydrogeological and environmental data have resulted in very large quantities of complex data to be managed on projects.

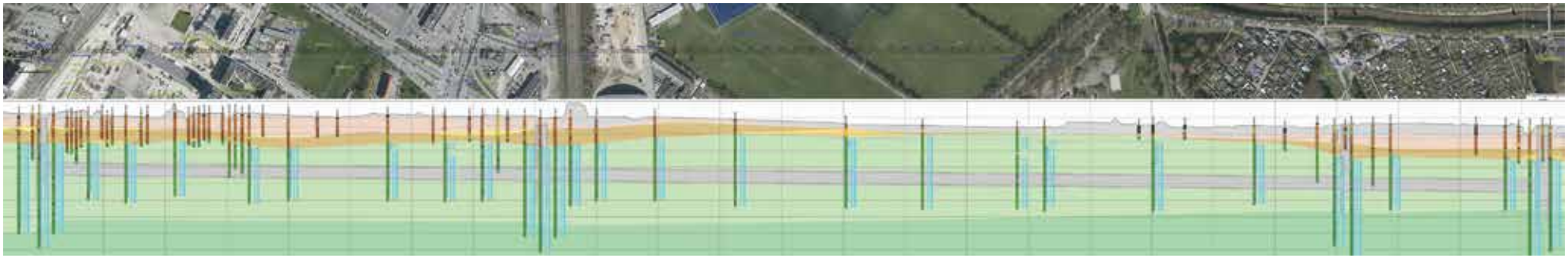
NIRAS has therefore implemented the latest internationally recognized technologies and developed in-house software to manage data efficiently using automated processes as well as ensuring the highest quality standards.

NIRAS is using GeoGIS for storage of data in line with the general industry standards in Denmark. However, to ensure compatibility with international software and standards, NIRAS has developed a data conversion tool between GeoGIS and AGS data format.

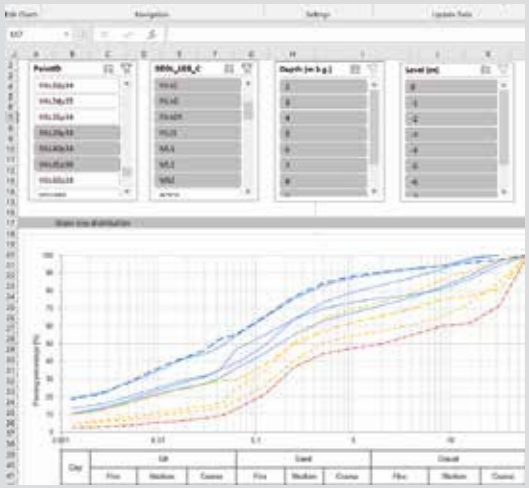
The AGS format is applied worldwide and is compatible with gINT, which is applied for managing data and production of fully customized high-quality profiles and other visualizations.

The gINT database file can be accessed by other software and therefore applied as a central database for production of graphs, tables, profiles, geological models, BIM models and much more.



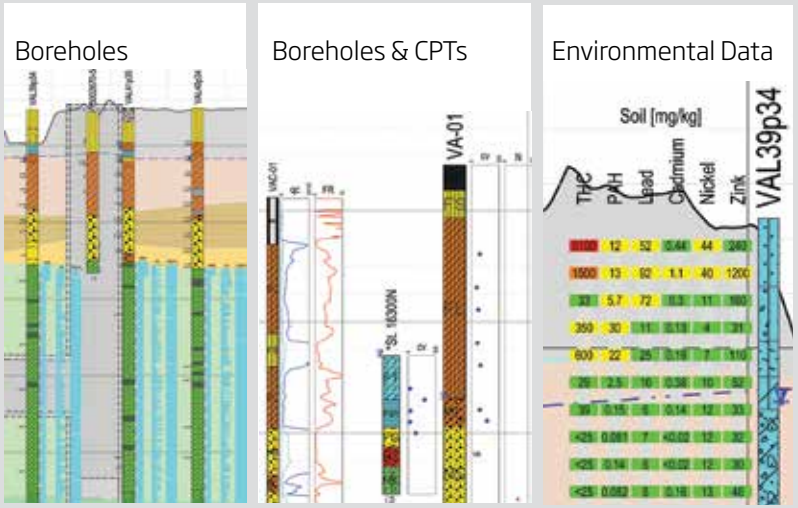


Graphs & Tables



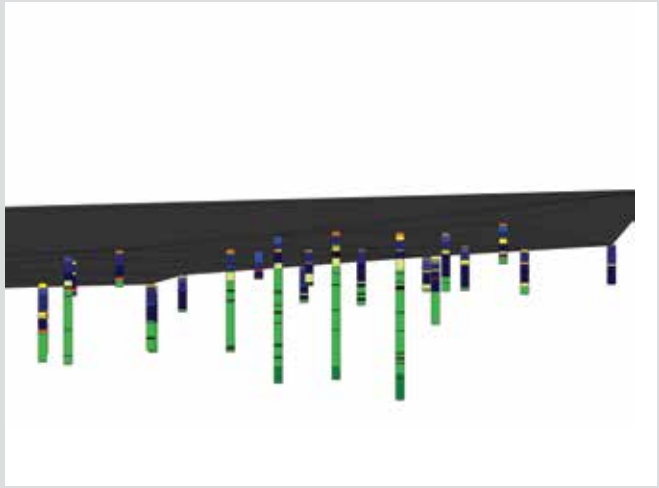
NIRAS' in-house Plotting Tool can automatically produce graphs and tables with data directly from the gINT database file. It is possible to select and deselect boreholes, soil and rock units, depth and level intervals to generate multiple graphs and tables with customized information according to the project requirements.

Geotechnical & Environmental Profiles



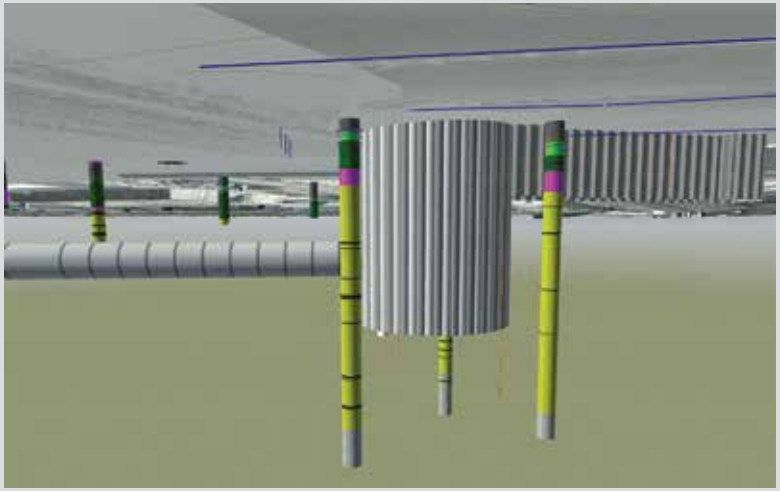
High-quality profiles are generated in gINT and customized according to the needs of each individual project.

Geological Models (3D)



True 3D geological models, surfaces and other data generated in gINT Civil Tools directly from the gINT database file. Surfaces and contour plots can furthermore be generated in Surfer.

Combined 3D models (BIM)



The 3D geological model is combined with 3D models from other disciplines in Revizto to provide one combined working platform for all.

Environment

For more than two decades NIRAS has been focusing on protecting the environment. We have vast experience in preparing environmental impact assessments (EIA) and strategic environmental assessments (SEA) for all types of projects, including railways, roads, industrial and processing plants, wind farms, harbours, shopping centres, hospitals, and cable systems.

Careful planning for impact assessment is essential, and NIRAS is keen to engage early in the development process. Early consideration of environmental issues, particularly where these lead to a requirement for EIA, SEA, or assessment under Natura 2000 regulations, allows cost-effective design options to be identified and evaluated.

NIRAS offers specialist advice on investigation, clean-up and development of contaminated sites. We have experience from thousands of contamination tasks covering both sites with new developments and those to be used for new purposes. We have extensive experience in all contaminant components such as oil, solvents, PFAS, pesticides, landfill gas, etc.

Our services include:

- Environmental impact assessments (EIA)
- Strategic environmental assessments (SEA)
- Nature restoration and protection
- Water and nature plans
- Nature protection regulations and the executive order on livestock
- eDNA analyses
- Environmental due diligence (EDD)
- Noise calculations, reduction level measurements (authorized by the Danish Environmental Protection Agency), and underwater noise calculations
- Investigation, clean-up and development of contaminated sites
- Soil management
- Geoprobe® work and development of contaminated sites
- Mobile drilling rigs with associated mobile laboratory equipment for on-site sampling and analysis of contaminated soil, water and soil gas at depths down to 50 meters

Environmental Impact Assessment (EIA) for motorway in Central Jutland (Give-Billund-E20-Haderslev)

The project includes implementation of an environmental impact assessment (EIA) for a new motorway in Central Jutland on the section Give-Billund-E20-Haderslev.

Mapping of existing environmental conditions was carried out, including field surveys for plant and animal life and environmental assessment of a total of six alternative routes as well as a variant east of Vandel. The studies and assessments cover a total of 180 km of motorway, but the individual motorway proposals have a length of 70-80 km. A prerequisite note, mapping report, environmental impact report, noise calculations, and contribution to a summary report were prepared.

On the basis of the mapping of the existing planning, nature and environmental conditions, an assessment of the environmental impact of the construction and operation of the new motorway was made.

In addition to the motorway system itself, the environmental assessments also included environmental assessments of temporary work areas and workplace areas. For all planning, nature and environmental issues, proposals for mitigation measures were prepared for neutralizing, minimizing or removing any negative impact from the motorway.

Preliminary assessments of the impacts on a total of 6 Natura-2000 sites, also referred to as Temporary Assessments or Materiality Assessments, were made.

Client: The Danish Road Directive

Country: Denmark

Period: 2017- ongoing

Services:

- Environmental Impact Assessment
- Field surveys
- Noise calculations

Environmental assessment of motorway

Client: The Danish Road Directive

Country: Denmark

Period: 2019-2023

Services:

- Environmental assessment
- Noise calculations
- Multi criteria GIS analysis

Implementation of a preliminary study of the southern Route 5 and 5½ between Køge and Frederikssundsvej including the preparation of a decision basis for narrowing the northern Route 5 and 5½ from the Frederikssundsvej to the Helsingørmotorvejen. In addition, alternative possibilities with an expansion of Route 6, expansion of a 4-lane motorway between Ringsted and Roskilde and expansion of the Holbæk motorway to 8 lanes on the section from Route 4 to Roskilde were investigated.

Environmental Impact Assessment (EIA) for the motorway E45 in Eastern Jutland (Aarhus S-Aarhus N)

Client: The Danish Road Directive

Country: Denmark

Period: 2018-2020

Services:

- Environmental impact assessment (EIA)
- Noise calculations
- Landscape analysis
- Visualizations

Planning and environmental studies incl. field studies of plant and animal life in connection with preparation of an environmental impact assessment for the development of the E45 Motorway between Aarhus S and Aarhus N. Furthermore, the project included noise calculations and landscape analysis and assessments as well as preparation of visualizations of the completed facility.

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