

The background of the entire page is a photograph of a port at night. Several large gantry cranes are visible, illuminated with blue and orange lights. The sky is a deep purple and blue, suggesting twilight. The cranes are silhouetted against the dark sky, with some lights reflecting off their structures.

# Smart & Green Ports

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Realising your sustainable potential



# Realising your Smart and Green Port Potential

**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.**

**Over 60 years of experience**

We have been delivering innovative maritime solutions for ports globally for over 60 years. Our collaborative and flexible culture enables us to provide tailored solutions to a port's development, asset management and operations. It is because of this unique service that many of our clients have been choosing NIRAS as their preferred consultancy service provider for many years and for numerous projects.

**We are international**

We are an international consultancy with strong Scandinavian roots that undertake projects globally. We have an extensive network of offices throughout Northern Europe, Scandinavia, Asia and Africa, as well as presence in North and South America. Our maritime services are delivered from key centres of expertise in the UK, Denmark, UAE, Indonesia and The Philippines.

**At the forefront of new technology**

The solutions offered for green and smart ports are numerous and developing all the time. Many of our specialists are leading experts in their fields, providing the latest in trusted bespoke advice to our clients. We are dedicated to providing a best in

class service and in this regard we have built up a network of specialist partners to perfectly complement our strong in-house offering.

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. All this forms part of an integrated plan, which ranges from expert port data analytics to software providers, as well as future planning in the form of smart and green ports masterplans. In short, we deliver all solutions to realise a port's sustainable potential.

**United Nations Sustainable Development Goals**

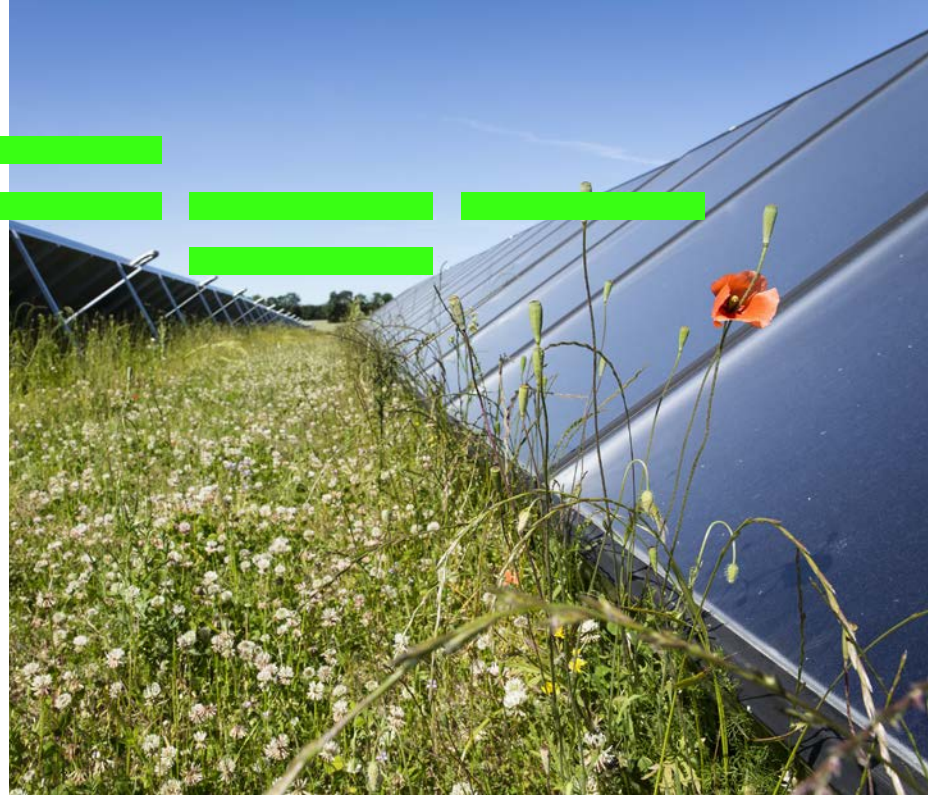
The United Nations' Sustainable Development Goals are at the heart of our culture and as such we naturally strive to integrate sustainable and green solutions into everything we do. More can be read on our commitment to sustainable development on our website: [www.niras.com/sustainability](http://www.niras.com/sustainability)







#GREENsition



When we talk of the Green Energy Transition, we are serious.

Since our inception in 1956, we have had a dedicated focus on sustainability. From working on the World's first offshore wind farm to promoting institutional development; from being world leaders on alternative fuels through to supporting governments with holistic governance solutions; from assisting with the sustainable development of key infrastructure to developing projects which reduce poverty and biodiversity loss; we are (and always have been) passionate about the sustainable progress of our society.



As a show of our dedication to tackling climate change and the need to adapt, we have pledged that for the next 10 years, a total of 13 percent of NIRAS's profits will be invested in green energy conversion efforts. The investment includes hiring 400 additional experts, further strengthening our position as a world leading consultant on renewable energy. Our pledge includes massive investment in research and development, competence development, partnerships, and recruitment in the fields of wind energy, electricity, and green fuels.

In order to be able to adapt our energy systems and energy in transport and manufacturing, we must adapt ourselves and our mindset. We must work with new technologies, innovative projects, enter into partnerships, change working methods, work together on the renewable energy of the future, smart grids, electrification of industry and mobility as well as green fuels. But it begins with you, and your business.

Whatever your starting point, we would like to work with you and your company on your potential in the green energy transition. Everyone has potential.

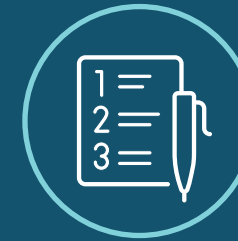


Green transformation of the world's energy systems requires community. We would like to cooperate with you, because the stakes are high and the pace needs to pick up. The Green Energy Transition needs to happen (and is happening) now.



# Our Services

We support clients to realise their sustainable potential in the development of green and smart ports through our multidisciplinary engineering and environmental consultancy services.



## Smart and Green Port Masterplans

Providing master development plans for integrating smart and green technology into the port as part of a port's overall masterplan.



## Digital Asset Management

Digitalisation of asset management including the acquisition, storage and handling of data.



## Simulation Modelling

Development of simulation modelling of a port to capture all live and historic data for a port as well as preparing digital twin models to assess new and improved methods of working.



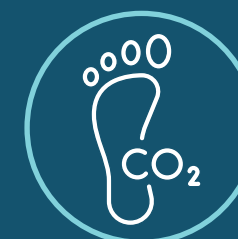
## Data Analytics

Provision of tools and services to review data collected on existing port operations with a view to optimising cargo flows, maintenance regimes and increasing overall port efficiency.



## Green Energy Transition

Development of green energy initiatives such as installation of wind turbines, solar panels, ground source heat pumps and the transition to alternative fuels.



## Carbon Footprint Assessment

Calculations to determine the carbon and environmental footprint of a port's operations or construction project.

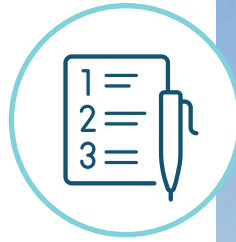


## Specialist Support Services

Dedicated and impartial consultancy services on a wide range of specific smart and green solutions that can make a real positive impact on a port's operation.



# Smart and Green Port Masterplans



**We work collaboratively with our clients and their stakeholders to integrate the planning and adoption of green and smart port technology into the port's main masterplan. We thereby secure a single, holistic plan for the future development of the port.**

The importance of developing a standard port masterplan is widely understood and recognised, ensuring that planned development is in line with long term port projections, giving a valid roadmap for discussion with investors, consultants and customers. We add further value to this process, integrating both short and long term development for smart and green ports.

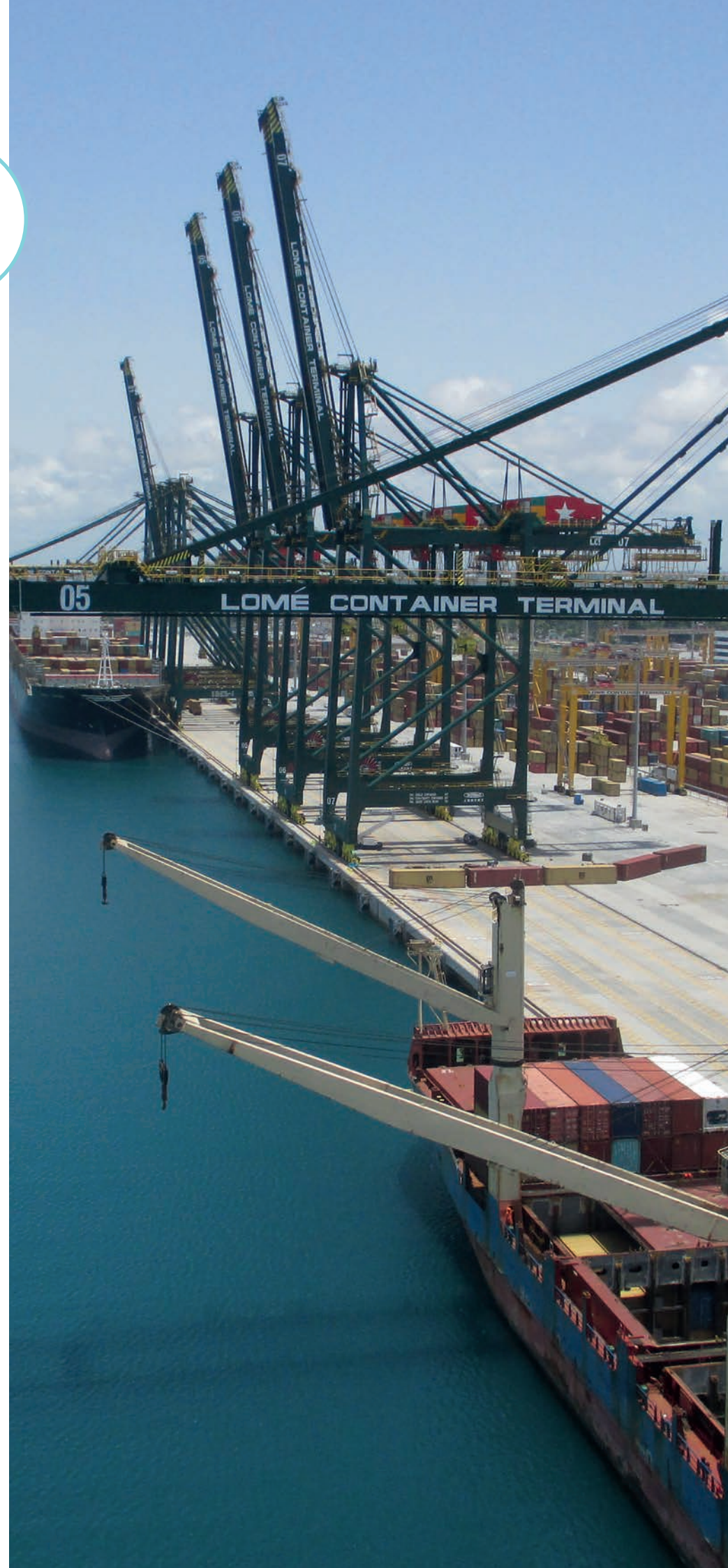
## **Best use of investment capital**

It can be difficult for ports to identify where investment capital is best placed in their development towards recognition as a green or smart port. The larger scale, longer term, highly visual and marketable smart port elements such as automation tend to attract the most attention, but there are numerous more achievable smart port solutions that can be readily adopted now, some with little initial capital investment.

Without a cohesive plan, the development of smart ports, green ports, and their associated data handling and security are liable to be made based upon personal interests or experience. This can result in less advantageous technologies being implemented, as well as technological implementation on an ad-hoc basis, without due regard to future developments.

At NIRAS, we pride ourselves on working closely with our clients to develop smart and / or green port masterplans which overcome the issues above, ensuring the best use of a port's available investment capital.

We combine our decades of experience in port masterplanning with our world leading smart and green ports consultancy services to provide innovative responses to the challenges our clients face.



## **Collaboration is key to planning**

We believe that collaborative development of green and smart port masterplans is crucial to gain maximum benefit from the process. We work in partnership with our clients and their stakeholders to achieve this, providing a single, holistic plan for the future of the port. Depending on a port's existing masterplan status, we can either prepare a new full masterplan study, or create an addendum to an existing masterplan that has been previously prepared.

## **World leading service in development of smart / green port masterplans**

We combine our decades of experience in port masterplanning with our world leading smart and green ports consultancy services to provide innovative responses to the challenges our clients face. We provide plans that not only give short term "easy wins", but also develop the roadmap and vision for the future, integrating short term implementation of technologies with a plan for adoption of future technologies in the medium to long term.

This approach ensures that technology implemented now can act as an enabler for future development and avoids it quickly becoming obsolete. Integrating this with the port's main masterplan allows us to design and envisage the physical changes to the port as a result of future technology and ensure that appropriate future allowance is made now, to allow easy adoption of new technology in the future.





# Digital Asset Management



**We advise our clients on Digital Asset Management solutions tailored for their individual circumstances and can prepare development plans to**

**achieve these goals as part of a smart port masterplan. Digital Asset Management can bring many advantages to a port, such as reducing downtime, increasing efficiency, and reducing insurance premiums.**

Digital Asset Management (DAM) can be defined as "The Digitisation and/or Digitalisation of the Asset Management Process". DAM can vary from a simple digital record of the port's assets to a detailed IoT Asset Management Tool used to proactively track and manage the port's equipment, structures and infrastructure. This in turn allows for targeted, proactive scheduling of maintenance activities to reduce disruption to daily operations and asset downtime.

With our expert team of staff and partners focussing on digital solutions for the marine environment, we bring cutting edge survey

technology and data acquisition together with specialist marine engineering expertise to provide our clients with a holistic approach to lifecycle monitoring of their vital assets.

- Digitisation of existing Asset Management process
- Laser Scanning, Bathymetry and Photogrammetry
- Derivation of fully integrated, geolocated 3D models of assets both above and below the waterline
- Use of digital models to prepare designs of complex capital works on structures with no existing "as-built" data
- Air and sea-bound drone surveys
- Capacity and condition reviews of a port's assets
- Derivation of an asset management plan
- Preparation of digital twins as an asset management tool
- Digitalisation of defect and maintenance management process
- Training and support for our clients to utilise the digital tools themselves



# Simulation Modelling



**NIRAS utilises highly specialised simulation software to build precise and predictive models of ports ensuring that our clients can make informed decisions. Our simulation models can review, identify and remove bottlenecks in existing operations. They can also review future development alternatives to give our clients the best solutions for their facilities.**

When a port is looking to expand or upgrade its facility, the decisions made during the design phase are critical to the future operations. Correcting errors at a later stage can be costly and disruptive, therefore the ability to foresee and solve any potential problems at design stage is very advantageous.

## Highly specialised simulation software

Our highly specialised simulation software builds precise and predictive models of ports to allow our clients to make informed decisions. Our simulation models can also identify and help remove bottlenecks in operations, giving our clients confidence that the best solution for their facility is developed.

One of the benefits of a simulation model is that it is not a one-off. Once the model has been built, verified and used to optimise the port's operations, the same model can be used again during the ramp-up/commissioning phase and also during future operational reviews.

During the commissioning phase, the simulation model can be loaded with the current performance, cargo and the expected ramp-up curves of the port's operations.

## Simulation tools create realistic expectations

Our simulation tools facilitate creation of realistic performance expectations, planning workforce requirements and anticipating throughput capacities, thus enabling mitigating actions before problems occur.

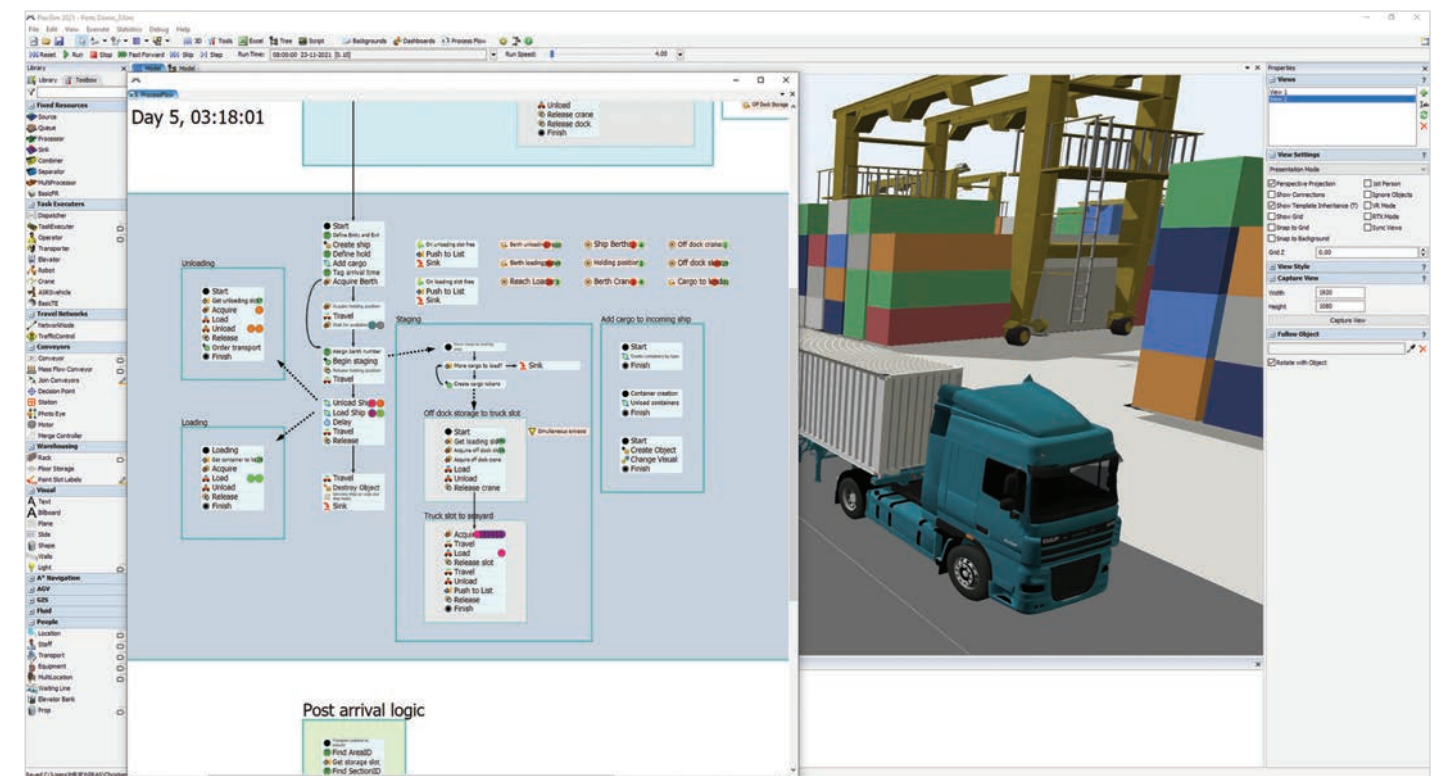
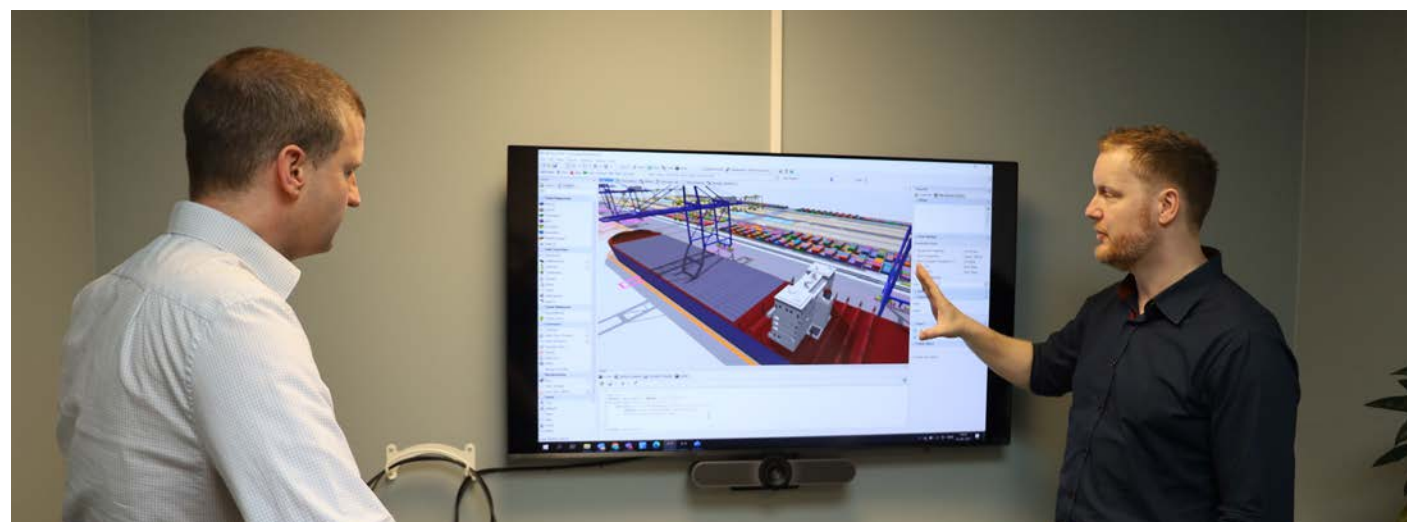
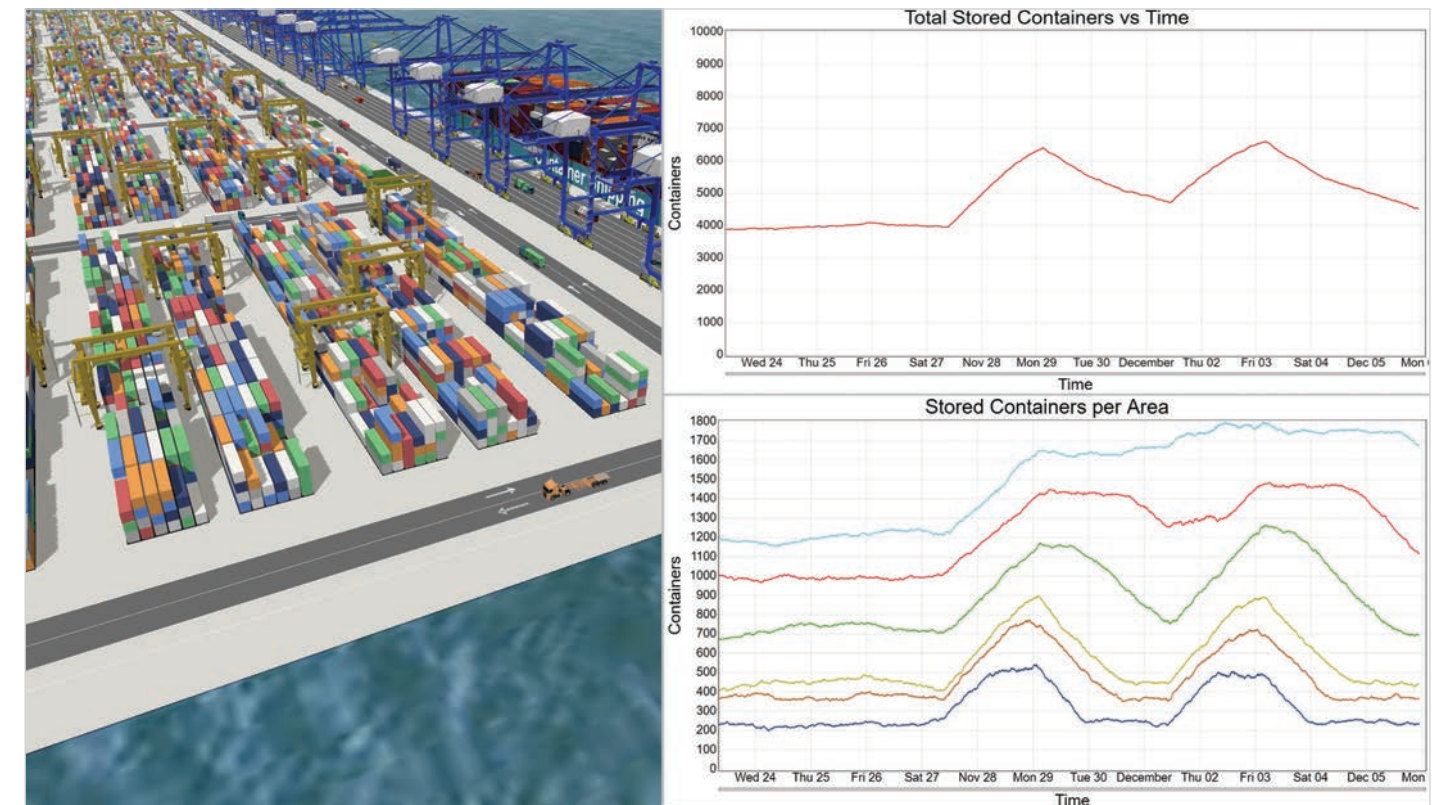
During regular operations, the model can be integrated with terminal operating systems and IoT devices to create a live, real time digital twin. In this instance, the single model can be used to predict the impact from equipment maintenance, purchase of new equipment, and changes to cargo schedules, for example.

## Global expertise in simulation models

In addition to ports, we have prepared simulation models globally for a wide range of clients and uses. This includes manufacturing, automated underground parking facilities, sterile hospital equipment process plants, automated hospital logistics, clinical hospital processes, mixed road construction traffic, and people flow in buildings with elevators.

We bring our global expertise across all these sectors to the ports industry to provide a best in class service, tailored to our client's needs.

We bring our global expertise across a wide variety of sectors to the ports industry to provide a best in class service, tailored to our client's needs.





# Data Analytics



**NIRAS' Data Analytics specialists create value for our port clients based on our industry leading knowledge of machine learning, data lakes, linked data, and Business Intelligence (BI), as well as ground breaking new digital technologies. We work with data in any format and provide optimisations such as automatic routines to extract data from existing systems.**

Data Analytics and the term "Big Data" can seem overwhelming and only relate to highly detailed and expensive analysis. However, data solutions do not have to be overly complicated and packed with buzzwords. At NIRAS we are expert users and developers of machine learning, data lakes, linked data, BI, and all the ground breaking digital technologies. Our aim is always to provide the best possible solutions for our clients, whether they are highly complex or just a further development of a good Excel solution.

## **We can create value from all kinds of data**

The everyday operation of most ports is increasingly dependent on the use of data. The data can be generated, stored and displayed in many shapes and formats. It might be an Excel sheet on a network drive, third party software, sensors, PDFs, databases, homepages, or even a simple paper based system or just hand written documents. We are happy to work with data in any format and provide optimisations, potentially including automatic routines to extract data from existing systems and reconnect them again.

## **Collaborative Development**

We prefer to develop solutions within our client's context. All our solutions are developed in close cooperation with both our clients and our in-house port operation experts. Wherever possible we strive to not introduce new systems, but extract data from existing systems as they look today. This secures the best possible fit to our client's needs and requirements as well as minimising disruption to ongoing operations.

## **Our services**

Data in itself, does not create any value. It is the insight, the decisions and the related actions based on well-organised, analysed and visualized data, that creates the value. We provide a series of services to support this process:

### **Extract, Transform and Load (ETL)**

We provide automated data extraction routines to set your data free. We transform the data tables into solid data models and load them into the analytics solution that fits your needs.

### **Automated report generation**

Standard reports typically consist of standardised formats with information that is periodically updated. We introduce new routines to automate this based on client's data sources.

### **Power BI dashboards**

Dashboards are typically used for financial overview, however we also use the technology to create insights from all other types of data such as asset management schedules, shipping schedules and staffing.

### **Advanced Excel solutions**

Modern Excel works neatly together with a lot of data sources. We use this extensively, as we have experts within advanced Excel functionality such as Power Query, Power Pivot, DAX and VBA.

### **Machine Learning**

We help our clients find correlations, trends and patterns which we can then use to make predictions, allowing them to optimise operations and processes, thus saving them both expenditure and time.

### **Advice on data outcomes**

We advise on data outcomes with insights on what they mean in an operational context and potential adjustments to benefit from these new insights.

### **Client Centric Empowerment**

We provide peer education and qualify your staff to empower them to take over the maintenance and further development of the solutions themselves.

### **Explore your data on a map**

We work with data on Maps in both web-GIS solutions, in-house developed platforms and directly in BI solutions to allow you to fully explore your data and give you the insights you need.





# Green Energy Transition



**We are world experts in wind and solar energy and in utilising biomass such as straw, wood chips, waste and biogas replacing fossil fuels for the production of steam, hot water, chilled water, and electricity. Our expertise encompasses all aspects of the transition from fossil to non-fossil energy production. With over 30 years of experience, we are the frontrunners of this energy transformation in terms of expertise, experience, and capabilities.**

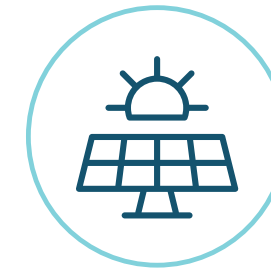
Along with our rich heritage, we are at the forefront of developments in new technologies. Within this space, we have successfully delivered numerous district heating and cooling projects where waste heat from industrial processes and sewerage treatment plants is being recovered for district heating or conversely, waste heat from cooling purposes is recovered by use of heat pump solutions (electrical, absorption) and utilised for adjacent industrial facilities.

We are international leaders in facilitating the green energy transition, helping our clients get the most out of their energy investments

## Unfolding enormous energy potential in ports

The possibilities for utilisation in a port environment are enormous, but also manageable. The changes can be started with just simple alterations to existing processes such as the installation of solar panels on an office roof and built from there. We provide assistance throughout the project development phases. This includes everything from planning, pre-feasibility studies, feasibility studies, environmental impact assessments and strategic environmental assessments, technical design, project management and procurement, to supervision of construction sites.

We boast vast experience in many renewable energy technologies, which allows us to tailor the correct green energy transition to each client's environment, budget and aspirations.



Solar PV and solar thermal



On and offshore wind energy



Co-generation based on waste



Biomass or biogas



Hydrogen



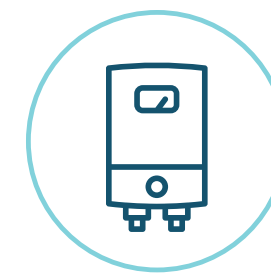
Waste-to-energy



Biofuels through power-to-x, carbon capture and storage



Thermal energy storage



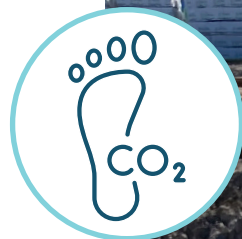
Heat pump systems



District heating and cooling systems



# Carbon Footprint Assessment



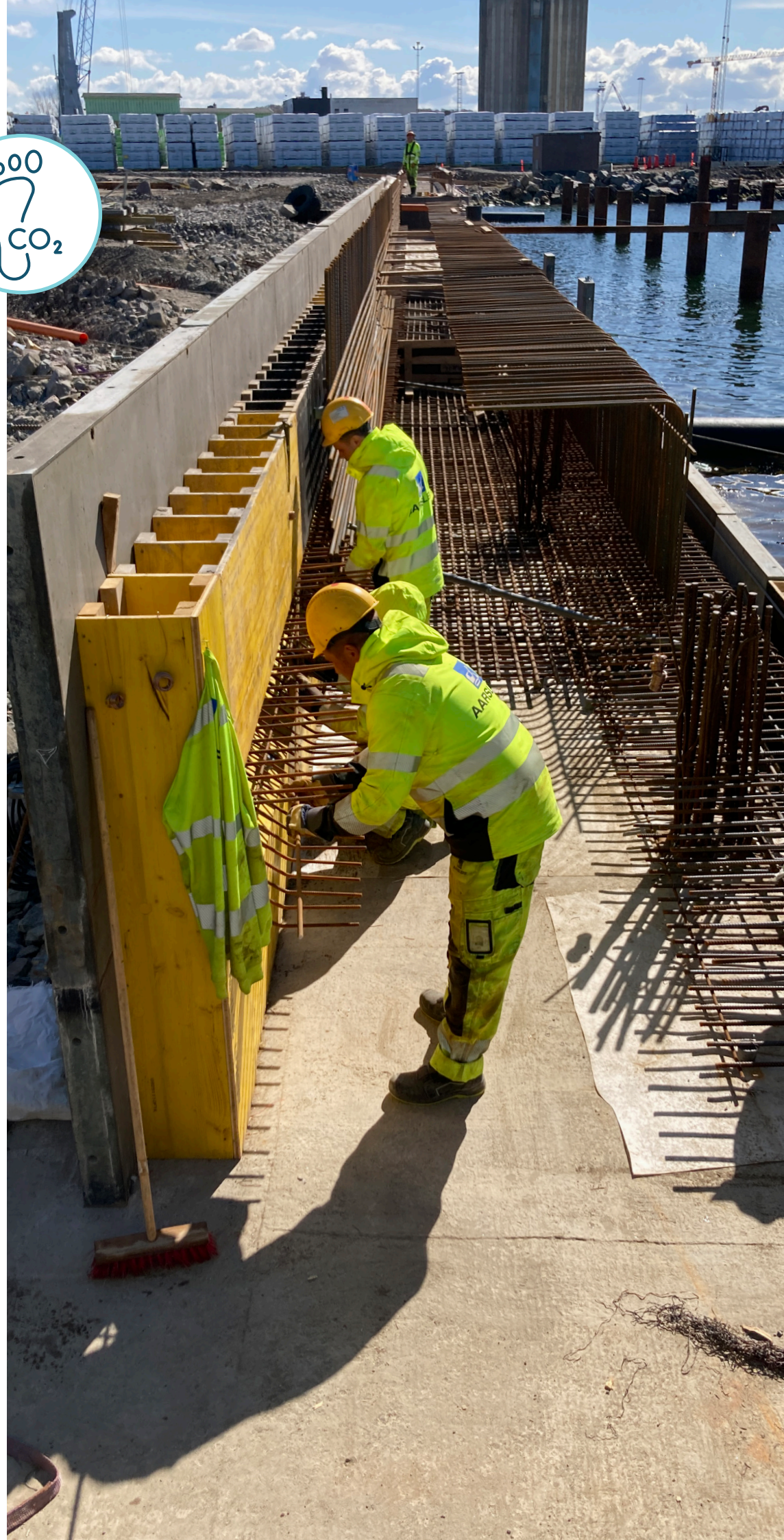
**The environmental impact of development and operations of all industries is increasingly becoming a focus of investors and stakeholders. Ports are no exception to this. However without quantifying the emissions and other potential impacts of projects and activities it is hard to know where the biggest risks are and what opportunities there are to reduce them.**

Carbon and environmental footprint calculations make environmental and resource efficiency measurable. At NIRAS, we can calculate the carbon footprint of a ports' ongoing operation, as well as for specific development projects. This way, we help our customers map their emissions, water consumption, local air pollution or other KPIs, for use in sustainability disclosure and reporting, as well as project optimisation. Footprints offer companies, municipalities or entire industries an overview of potentials for value-adding environmental initiatives, new strategies and circular business models. They can also contribute to reviewing the environmental impact of a development project and give rise to alternative means to reduce the carbon footprint of a scheme.

Calculating the carbon footprint of a development project can contribute to the development of an Environmental Impact Assessment and will demonstrate to stakeholders that you as a port know exactly what the impact of the development is, as well as allowing ports to propose appropriate mitigation measures.

Furthermore, quantifying and developing scenarios for carbon footprints, can be central elements in the development of a NIRAS green port masterplan, providing the port with a route map to environmental sustainability, integrated in with the ongoing development needs of the port.

NIRAS' consultancy services make environment and sustainability measurable. We make calculations for the green transition to allow our customers to choose the best solutions for the climate.



## **NIRAS has experience within the fields of:**

- Global goals, SDG indicators and reporting
- Carbon footprint reporting and climate accounts
- Life Cycle Assessments, Product Environmental Footprints, Product Environmental Declarations etc.
- Natural capital account (NCA), Environmental profit & loss account (E P&L)
- Greenhouse gas protocol, Paris Agreement
- TCFD, CDP of SBTi reporting

NIRAS' consultancy services make environment and sustainability measurable. We make calculations for the green transition to allow our customers to choose the best solutions for the climate.



# Specialist Support Services



**We deliver dedicated and impartial consultancy services on a wide range of specific smart and green solutions that can make a real positive impact on a port's operation. Our clients can draw on our ample in-house expertise, supplemented with a global network of partnerships with specialist suppliers.**

Below is outlined an exemplar range of the dedicated technologies and services that we can assist our clients with. However, this list is non-exhaustive and we are happy to advise our clients in the acquisition of all forms of smart and green technology.

## **LED Lighting**

State of the art LED lighting reduces energy usage and maintenance, increases light clarity and reduces the number of lighting masts required at a site.

## **Electrification of Port Equipment**

Reduction of emissions by converting existing port equipment to hybrid / electric power and state of the art charging mechanisms.

## **Smart Mooring Systems**

Various solutions which can reduce berthing / unberthing times, minimise vessel movement at the quayside and allow for greater safety, knowledge and control over mooring operations.

## **Automatic Numberplate Recognition Systems**

Advanced systems to recognise landside traffic before it arrives at the port, allowing for reduced landside congestion and more efficient internal operations.

## **Wireless / Local Networks**

These allow for the introduction of IoT tools and more efficient operational management. Wireless / local networks act as an enabler to many smart port technologies.

## **Automated Terminal Operation Systems**

Software packages used to keep track of cargo and manage it, reducing paperwork, increasing efficiency of operations and providing a single source of the truth for the daily operations of a port.

## **IoT Sensors**

Sensors which can be placed on all forms of equipment, structures and infrastructure that provide live information. This can later be analysed by our expert data analysis team to improve operations and reduce costs.

## **Shoreside Power**

Provision of electric power to vessels in place of running their engines. This can apply to everything from a small pilot vessel up to the largest of modern commercial ships and results in reduction of emissions and an increase of air quality in and around the port.

## **Equipment Fleet Management Systems**

Cutting edge management systems for a port's equipment fleet, increasing efficiency of operations and allowing for smart scheduling of maintenance which reduces downtime and operational disruptions.

## **Cyber Security Consultancy**

Use of technology means a cyber security risk. We take proactive steps to understand cyber risk exposure, build resilient digital architecture and plan for cyber security incidents. Quantified analysis informs investment cases and integrates robust cyber strategy to protect operations.







# NIRAS GREEN TECH HUB



**As part of our dedication to supporting and providing sustainable solutions in line with the United Nations' Sustainable Development Goals, we have developed a Green Tech Hub in our headquarters in Allerød, Denmark. The hub provides green tech start-ups with 5,000m2 of office space, storage and production facilities.**

The facility allows start-ups to rent large storage spaces, test and showcase their ideas and have actual production in the production hall.

The start-ups gain access to our extensive pool of engineering specialists, who work collaboratively with the start-ups to realise their sustainable potential.

### **NIRAS partners with green start-ups**

The co-development and collaboration between start-ups and NIRAS' many experts provides a fast track route to growing ideas and innovations. Once start-ups become established, we continue to partner with the companies for the benefit of our businesses, our clients and the entrepreneurs in the new Green Tech Hub.

The NIRAS Green Tech Hub means that our clients are connected to, and can benefit from, the latest in developing green technology and ideas.



# Realising your sustainable potential



## Quality, health and safety and environmental performance

Each of our projects is organised and delivered to the highest standards of quality, health and safety and environmental performance.

Our management systems are developed in accordance with relevant international standards: BS ISO 9001:2015, BS ISO14001:2015, and BS OHSAS 18001:2007. Each component of this system is certified by an independent IAF/UKAS accredited certification body.

## Ethics and integrity

The NIRAS Group operates at the highest standards of business ethics and integrity. We have a zero-tolerance policy towards corruption, tax evasion, fraud, modern slavery and human trafficking. We strive to create a workplace that is free of all forms of discrimination and harassment.

## UN Global Compact

NIRAS is linked to the UN Global Compact and to International Federation of Consulting Engineers (FIDIC). We have developed a Business Integrity Management System which is applied systematically as a tool to prevent any kind of corruption and bribery. Our policy in this area is fully in accordance with OECD and FIDIC recommendations.

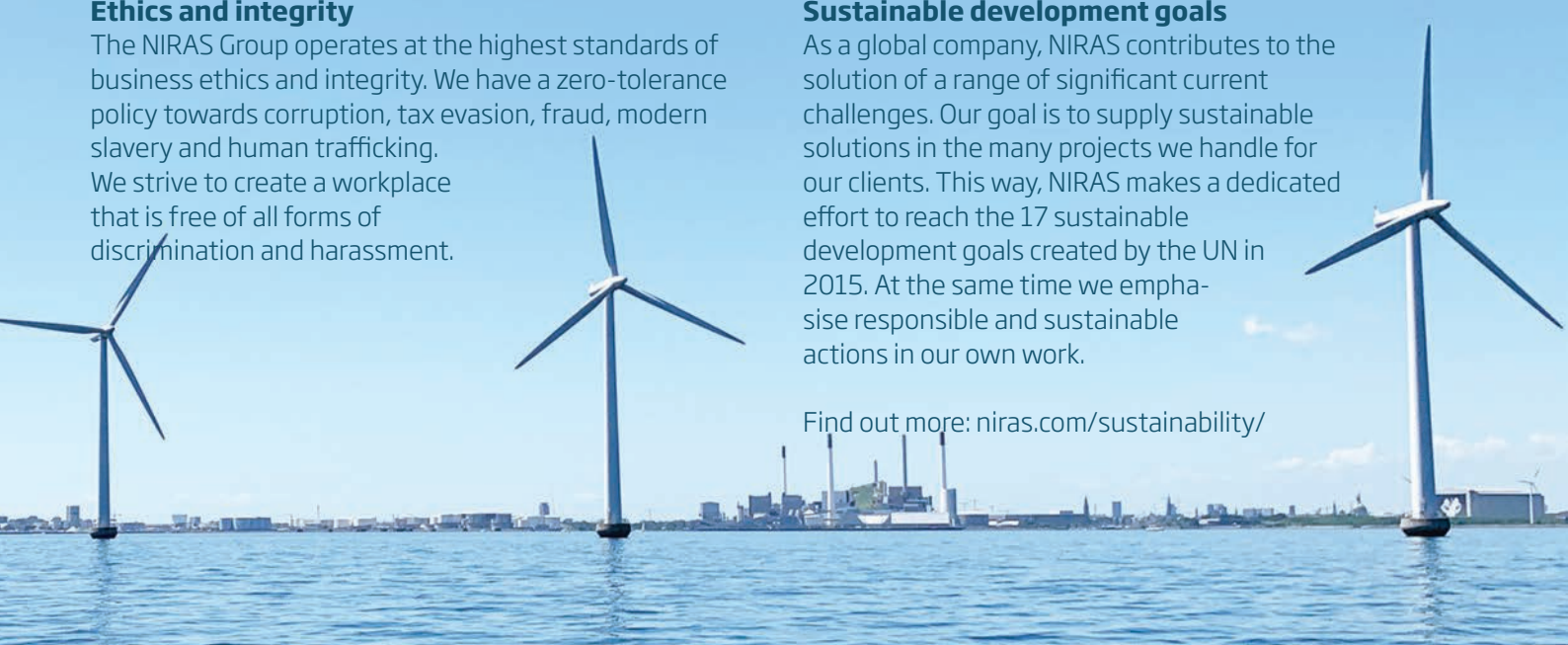
## Further details to be found here:

[niras.com/about-niras/corporate-social-responsibility](https://niras.com/about-niras/corporate-social-responsibility)

## Sustainable development goals

As a global company, NIRAS contributes to the solution of a range of significant current challenges. Our goal is to supply sustainable solutions in the many projects we handle for our clients. This way, NIRAS makes a dedicated effort to reach the 17 sustainable development goals created by the UN in 2015. At the same time we emphasise responsible and sustainable actions in our own work.

Find out more: [niras.com/sustainability/](https://niras.com/sustainability/)



**Adam Sharp**  
Masterplan Specialist



**Andrew Walker**  
Digitalisation Specialist



**Martin Bo Jensen**  
Simulation Modelling Specialist



**Torben Kirk Wolf**  
Data Analytics Specialist



**Niels Bahnsen**  
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## Follow NIRAS :

Stay updated on the latest news, methods and solutions.



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