



# *Special*

## GENERAL PLANNING 4.0



**INROS LACKNER.**



### Dear readers,

General Planning 4.0 refers to the changes in the construction industry that are resulting from the fourth industrial revolution (Industry 4.0). As a General Planner, Inros Lackner brings together a wide range of specialist disciplines in one company, combined with appropriate IT systems and organisational structures that have been developed over many years. Although it presents new challenges, digitalisation makes it possible to optimise processes and structures, maximising future benefits. In doing this, it is important to maintain a balance between the tried-and-trusted and the new. As technical designers and general planners, we have been implementing complex projects with dedication and ambition for over 80 years. It is this experience that we bring to the increasingly popular General Planning projects on which we work, constantly benefitting from it in relation to issues such as functionality, sustainability, technological developments and communication structures. In this issue we explore the developments required in order to remain successfully positioned in the market, and take a look at some of our existing competencies and general planning projects. Digital processes are still largely »impulses« in General Planning projects, but in future they will be increasingly integral in contract award and implementation processes. Digital integration is necessary throughout a structure's entire value chain, from the planning and design stage right through to operation and maintenance.

Let's seize the opportunity offered by digitalisation – in conjunction with the right technical resources – in making planning and design processes, and construction projects, even more efficient and forward-looking than they are today!



Dr. Klaus Richter  
Executive Director

Torsten Retzlaff  
Executive Director





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### Change in the Supervisory Board

Professor Dr. Ing. Katharina Klemt-Albert is the newest member of Inros Lackner's supervisory board. Since 2016 she has headed the Institute for Construction Management and Digital Construction at Leibniz University in Hanover, with the focus in her research and teaching on digital transformation and digitalisation in design, construction and operation. Professor Klemt-Albert spent 14 years at a top management position in Deutsche Bahn AG, most recently managing an international project service provider with 1,500 employees. There, she was responsible for the realisation of major projects in Germany and worldwide. She has a strong personal interest in the development and implementation of technical innovations. Her experience in consulting and her in-depth knowledge in the fields of digitalisation and building information modelling (BIM) are a great asset for Inros Lackner, as noted by Uwe Lemcke in welcoming her to the board.

### Grand opening of the new Bauhaus Museum in Germany

The opening of the museum, with German Chancellor Angela Merkel present, is one of the highlights of the centenary year of Bauhaus. After two and a half years of construction, the museum was inaugurated with a ceremony on 8th September 2019. Inros Lackner was responsible for the design of the technical building systems of the new building, which was built at a cost of approximately 28 million euro. The public presentation in this building of the world's second largest Bauhaus collection requires highly sophisticated technical solutions. Ducting for electrical equipment was provided in the exposed concrete ceilings, and the technical equipment for the exhibition areas was designed to be flexible and independent. Key components of the energy concept include a combination of thermal mass activation and air condition-

ing systems to ensure climate stability, and natural ventilation of the spacious foyer with its transparent façade.

»The implementation of this sophisticated indoor climate concept makes possible, for the first time, the comprehensive public presentation of the Bauhaus Foundation's valuable collection in Dessau – in particular its unique original artefacts from the 1920s and 1930s«, says architect Dr. Ing. Haie-Jann Krause, Head of Complex Building Design at Inros Lackner SE, emphasizing the project's great significance. Already in the architectural competition phase, the design by Gonzalez Hinz Zabala of Barcelona was a worldwide sensation. It represents – like Bauhaus itself – contemporary sustainability, efficiency and entire generations of construction.



Source: bauhaus-dessau.de. Photo: ©Thomas Meyer/OSTKREUZ



### Hanoi's new courthouse

On the basis of an international competition, Inros Lackner Vietnam has been appointed as General Planner for the construction of Hanoi's new courthouse. In the course of the competition, Inros Lackner submitted two designs which considered the identity and traditional values of the Vietnamese culture. The designs presented a modern work environment with clear, transparent spaces and courtrooms for around 600 judges. In consultation with the client, the People's Court of the City of Hanoi, a new neoclassical design was developed on this basis. The construction costs are estimated at USD 30 million, and the gross floor area is approximately 30,000 m<sup>2</sup>.





### In the Top 10 of the world's most beautiful museums

In fifth place, Hanoi City Museum – an Inros Lackner reference project. Architecture and engineering meet in the design of Hanoi's city history museum – a special structure that showcases the heritage of Hanoi over the last 1,000 years and has been ranked fifth among the ten most beautiful museums in the world. The impressive building with a gross floor area of 30,000 m<sup>2</sup> resembles an upside-down pyramid. The

top floor has the largest dimensions, at 92.4 m x 92.4 m. Moving downwards, the dimensions decrease – to just 42 m x 42 m on the ground floor. The building has an atrium from which all exhibition floors can be accessed. The architecture firm of Gerkan, Marg and Partners designed the new building. Inros Lackner was responsible for structural design, technical building systems and infrastructural planning.



### Major waterway project in India

Inros Lackner is playing a key role in a project to improve and maintain the navigability of National Waterway 1, India's most important waterway and part of the Baghirati-Ganges river system. The sacred river, which has great economic value as an environmentally friendly, inexpensive and fuel-saving transportation route, is to be kept navigable over a distance of 711 kilometres. On behalf of the Inland Waterways Authority of India (IWAI) and the World Bank, Inros Lackner is responsible – in the roles of Technical Service Support Consultant and Project Management Consultant,

with 40 German and Indian engineers – for site supervision and project management.

Over a period of five years, the main shipping channel in six sections is to be kept navigable by continuous maintenance dredging. The cost is approximately 160 million euro, and more than 600 people are involved on site. A particular challenge is the large seasonal fluctuations in water level, over which the shipping channel's minimum depth must always be maintained. The volume of excavated material is expected to be around 35 million cubic metres.



©Liebherr

### Giant crane in Rostock Port

One of the world's largest heavy-duty cranes enters service: Liebherr's TCC 78000 rail-mounted heavy-duty gantry crane can lift loads of up to 1,600 tonnes, is 164 metres high and weighs 5,500 tonnes. From its factory site at Pier III in Rostock Port, the crane can be moved all the way to the quayside at Berth 14 and used anywhere along the way. The addition of this high-end heavy-duty crane is a significant upgrade to the port's infrastructure. Inros Lackner was responsible for the foundations and external facilities for the crane, which has a total cost of approximately 43 million euro. This included two deep-founded beams to carry the crane track, supported on a double row of bored piles. In total, 756 bored piles of diameter 930 mm were required, with lengths of between 18 and 23 metres – dimensions that, corresponding to the size and function of the crane, presented significant design challenges.



## Competencies

Complex  
buildings



Maritime engineering  
and ports



Energy, environment  
and sustainability



Infrastructure



Approvals  
management



Project and construction  
management

## Services



Technical advice  
and expert  
opinions



Architecture/  
Urban planning



Foundation  
engineering/  
Geotechnics



Civil  
engineering



Contaminated  
sites



Surveying



Building  
Information  
Modelling



Structural  
design



Technical  
equipment



Maritime design



Port operations/  
logistics



Bridge/tunnel  
design



Road  
engineering



Railway  
engineering



Traffic  
engineering



Control and  
safety systems



Noise protection



Environmental  
planning

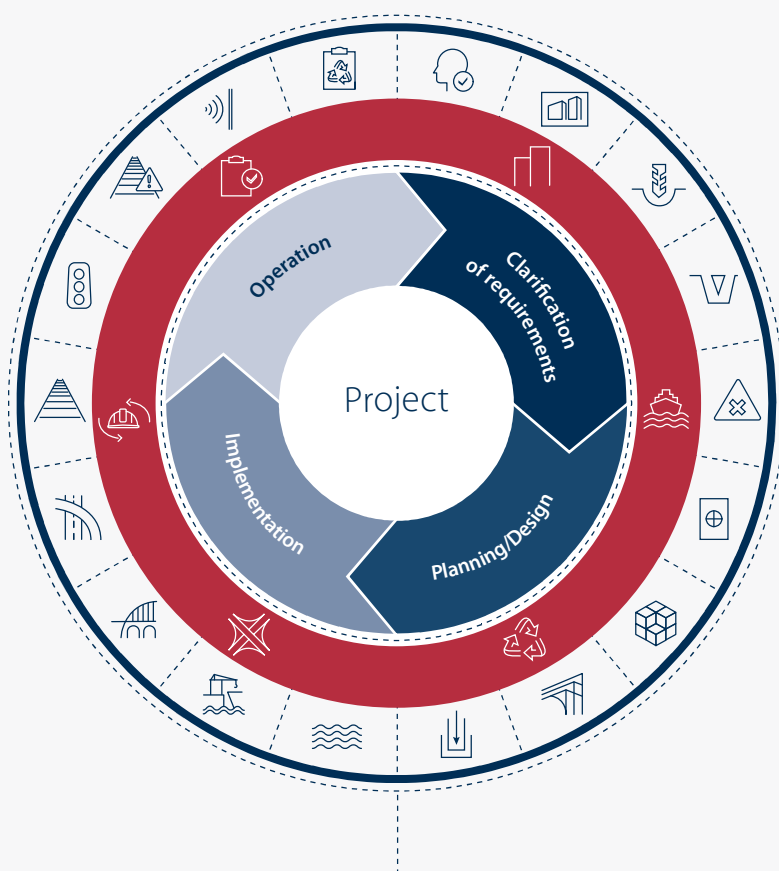
# GENERAL PLANNING 4.0

Overall responsibility for projects in the context of Industry 4.0 is determined by new forms of collaboration and digital planning processes.

General Planning is characterised by coordination and integration, interdisciplinary thinking and the early involvement of all participating parties. There is no binding definition or clear specification for how responsibilities are shared. The requirements vary with the project and the client's objectives. As a General Planner, we can combine a wide range of specialist engineering services in-house and if required, integrate further services by working with sub-contractors in a joint venture. The goal is to optimally coordinate complex processes and how the work is carried out. In our work we represent the client's interests, manage interfaces between the involved parties and provide project management services – with the aim of optimising planning and design work and achieving greater cost and schedule reliability. With the increasing digitalisation of planning and design processes, the structures of General Planning are also changing and require us to continually acquire new com-

petencies – both technical and interpersonal – and to always look to the future. As a result, we consider the entire life cycle of buildings in terms of sustainability and maintenance. Digital models are used to illustrate project objectives and facilitate coordination with the client. And within the team, everyone has access to the same information.

On the following pages we report on certain key aspects of General Planning, with particular reference to digitalisation. Initial digital approaches to projects will be presented, as will traditional General Planning measures that we have successfully implemented with the integration of digital working methods. Without these experiences, our work and development as a General Planner would not be possible.



## Clarification of requirements

- Consultancy advice and guidance
- Focus on structure life cycle
- Digital documentation of existing situation

## Planning/Design

- Project start-up consulting
- Coordination of planners/designers
- Integrated planning and design (3D)

## Implementation

- BIM execution plan (4D)
- AVA and process simulation (5D)
- Quality assurance
- Schedule and cost reliability

## Operation

- Maintenance
- Repair
- Demolition/removal

## IN CONVERSATION

**Matthias Grabe**

*Chief Technical Officer (Member of the Executive Board),  
Hamburg Port Authority AöR*

Matthias Grabe studied civil engineering at the Technical University of Braunschweig in Germany and at ETH Zurich, Switzerland's leading technical university. In his studies he specialised in structural engineering, hydraulic engineering, environmental engineering, geotechnics and tunnelling. He spent the first years of his career at HOCHTIEF and Ludwig Freytag, working on design, work preparation, estimating, purchasing and construction management. Thereafter, he took on increased responsibility for budget and personnel, in companies and in the management of major projects, both on the contractor side and in representing clients, project developers and investors.

In the last ten years, Matthias Grabe has been a manager at DB Netz, the German railway company's network division, and at the Wiebe Group. At DB Netz, among other things, he headed the company's bridge advisory board for several years. Since 1st October 2017, he has been Chief Technical Officer of the Hamburg Port Authority (HPA).



*Mr. Grabe, what key advantages do you see in integrated planning and design by a single contract partner?*

A General Planner offers a basis for efficient and reliable planning and design, through the internal close collaboration of all involved parties. As a client, I receive a structure that has been planned and designed by a single business partner, and the entire responsibility for planning and design lies with that partner. All trades and design aspects, from the piles in the ground to the lightning conductor on top, are coordinated in a single overall approach.

In the end, the ability to communicate effectively – both externally and internally – is defining for the benefits, or success, of General Planning work. However, while

»The exponential growth in digital data facilitates great improvements in performance – we need, 'smart structures'«

external communication is generally well covered by regular reporting to the client on planning and design progress, internal communication is often neglected. Coordination of work on a BIM model is not a substitute for good internal communication. In my view, project communication is an aspect of work culture that has potential for real development in the context of General Planning.

*General Planning makes it possible to network complex technical resources with individual customer needs. Do you have specific requirements in relation to the increasing demands on construction processes and developing digital capabilities?*

Yes, the focus must be increasingly on the life cycle of a structure – in particular, operation and maintenance – from the outset. For example, the design and construction phase of a canal lock is typically about five to ten years, but the operation and maintenance phase will last between 50 and 100 years. Planning, design and construction therefore account for only one tenth of the lifespan of such a structure. I expect this factor of 10 to be recognised and integrated accordingly into the planning and design process. I am interested in a forward-





looking planning and design process that looks not only at initial technical aspects, but also at maintenance. BIM models must be compatible for digital maintenance, so that structure maintenance can be carried out and recorded using modern computer technology. I am talking about »smart structures« in the sense of predictive maintenance. Relevant data, e.g. for the maintenance of bridges, must be proactively recorded. This will enable maintenance measures to be arranged in good time and problems to be avoided. This is already working very well in other industries in the era of Industry 4.0, but not yet in the world of civil engineering. Here, the focus is primarily on the construction process, and less on the time thereafter.

*Digitalisation makes possible the ever-increasing availability of relevant data. What are the benefits of this for General Planning?*

The exponentially growing amount of data in the digital planning process facilitates enhanced transparency and real performance improvements. The targeted use of this data supports reliable predictions relating to the condition of structures, machines and fa-

»I am interested in a forward-looking planning and design process that looks not only at initial technical aspects, but also at maintenance.«

cilities. This makes planning and implementation of maintenance work more flexible. Loads and deformations can be calculated, extreme values can be assessed, and decisions can be made more quickly. Where appropriate, consideration can be given at an early stage to renovating a structure or removing it from service.

*What potential for optimisation, or what added value, do you see in working with a General Planner?*

Significant potential lies in forward-looking planning and design, and in consideration of the life cycle of each structure. With this knowledge, the General Planner must increasingly take on the role of a consultant, one of whose tasks is to convince the client that, although the initial investment may be higher, operation and maintenance costs over the entire life of the structure will be considerably lower. There must be a clear understanding: if we invest more up front, it will end up being cheaper. The great added value of General Planning lies in the cooperation itself. If all trades work well together, and project communication is transparent, the client can have confidence in the outcome.

*In your view, what potential is there for market participants to become involved, e.g. through joint ventures?*

In the private sector, a General Planning team of well-known and proven specialist planners and designers can be readily brought together. However, public contracts cannot be awarded in such a forward-looking manner due to the constraints of public procurement law.

*Do you see a need – or an opportunity – in the future for other partnership-based contract models?*

I see a very great need for partnership-based contract models – avoiding the conflict culture which in my view dominates today's project work too much. Engineers have lost sight of the end product in the hustle and bustle of contract work. Clients are only interested in optimising the price. The elimination of mistakes does not happen collaboratively, there is no culture of working towards a common goal with regard to construction progress within the programme. The focus is on the claims dispute. There is a great need in the industry for alliance and consensus.

Public procurement allows competitive dialogue, an approach we use at HPA. Alliance projects are being pushed forward and the first pilot projects are being implemented in the Port of Hamburg. This teamwork approach is aimed at mediation rather than confrontation.

## IN CONVERSATION

**Lutz Hempelt***Executive Director, INROS LACKNER SE*

Lutz Hempelt studied civil engineering at the Technical University of Wismar. As a construction management engineer, he has gained more than 30 years of professional experience in all areas of hydraulic, civil and structural engineering. He specialises in commercial and technical management, and in schedule controlling for all participants on large construction projects and complex General Planner contracts. He spent twelve years at Heitkamp Construction as branch manager, and has been a member of the company management at Inros Lackner SE since 2014.

»With a view to Industry 4.0, a continuous digital connection from the quotation stage through the construction management phase and right up to the structure's operation and maintenance is a necessary development.«

*Mr. Hempelt, with increasing client expectations and constantly developing digital capabilities, business processes are fundamentally changing. How have the business structures at Inros Lackner changed in recent years in order to be successful on the market as a General Planner?*

We recognised the opportunities offered by digitalisation at an early stage. In 2014 we established our Building Information Modelling (BIM) working group, and integrated this working method into our process landscape. We have established our own internal guidelines for BIM projects, and are currently creating individual guidelines covering the increasingly complex requirements of the various disciplines/trades. Our goal is to improve the coordination among the BIM discipline models and to further optimise the processes and interfaces. Our BIM guidelines have now been fully integrated into our certified quality management system. In addition to this digitalisation work, we have also further expanded our specialist knowledge capabilities and adapted these in line with current developments. By having direct access to a wide range of services – covering traditional disciplines as well as specialised expertise relating to such aspects as contamination management, sustainable energy design and BIM – we can minimise the risk of problems at the planning to implementation interface and quickly respond to detailed questions during the planning/design process.

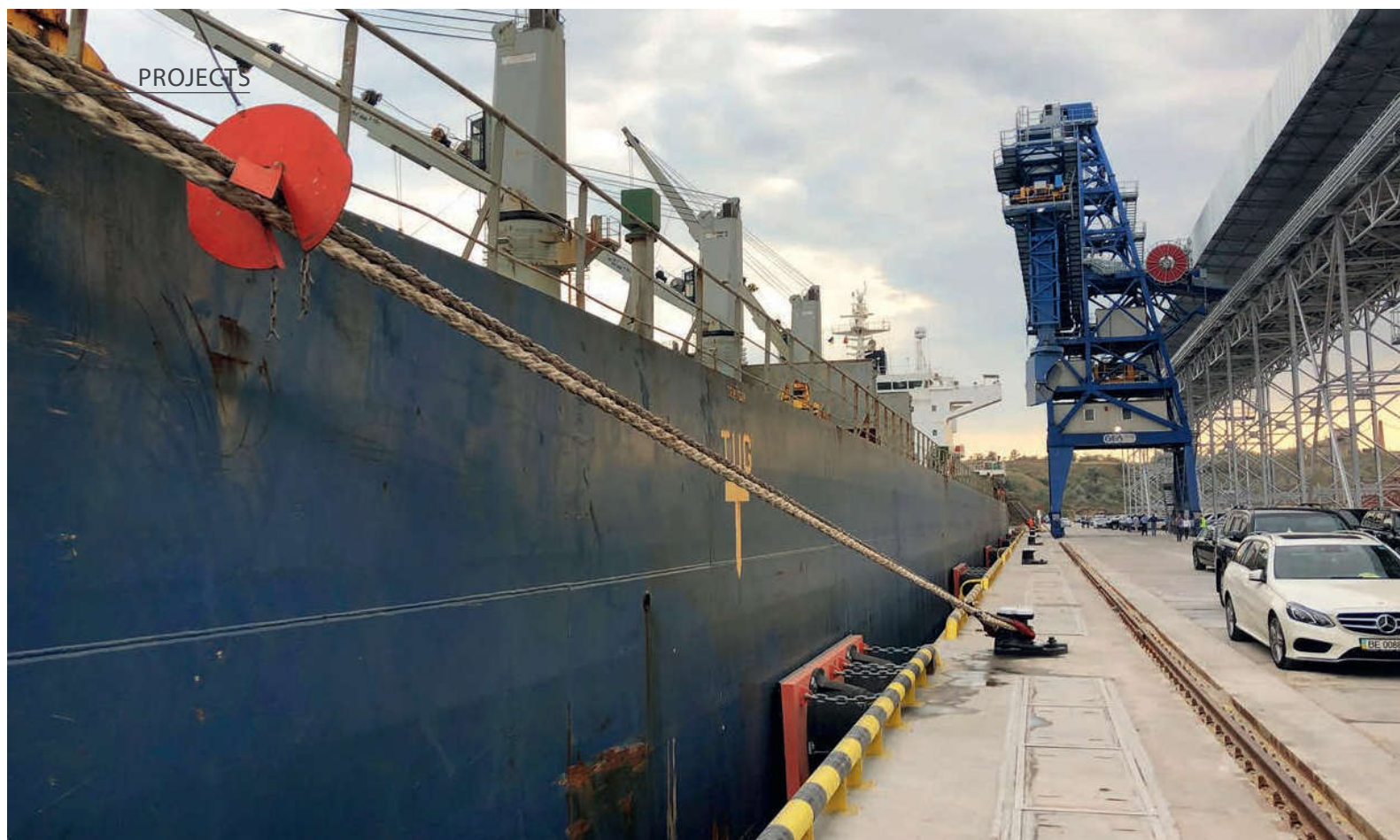
*Strong customer focus, transparency and continuous project optimisation are the often-mentioned advantages of General Planning. Are there any other aspects that you would add?*

Yes, there are clear advantages for quality. Internal interdisciplinary cooperation allows for simultaneous interconnection of project data at every stage. This further optimises interface management between trades/specialisations and minimises the error rate. If design is carried out in a model-based way, this further enhances quality control; potential errors can be identified by routine model checks. The quantities derived from the model also help improve cost reliability for all trades.

Clients can also better understand and track planning and design decisions based on such models. For this purpose, and also to enhance cooperation in the team, we have created collaboration rooms. Here, designers and the client make joint decisions with direct reference to a model.

*Why is General Planning particularly interesting for complex large-scale projects?*

The number of trade-specific interfaces is greater. Large infrastructure and structural engineering projects have enormous planning, technical and organisational complexity. As contractual partner with sole responsibility for planning and design, a General Planner simplifies things for the client, performing the task of interdisciplinary coordination – closing gaps at interfaces, identifying risks, improving cost certainty and enhancing adherence to deadlines. A guarantee for this is the prerequisite expertise and mastery of the appropriate project management tasks as verified by relevant project references. Those who have not planned and designed structures of a particular type – such as bridges or laboratories, for example – will not be used on projects of that nature.



Visualisation of port development

## NEW GRAIN TERMINAL IN YUZHNY PORT

Significant investments are being made in the development of Ukraine's seaports – including in relation to transportation of bulk goods thanks to increasing volumes of agricultural exports.

In the Port of Yuzhny, near the city of Odessa located at Ukraine's Black Sea coast, a state-of-the-art grain terminal with an annual throughput capacity of up to 5 million tons has been built. Grain is one of the seaport's main type of bulk cargo, and the development project has created approximately 500 new jobs. The construction of the new terminal, a joint project of MV Cargo and Cargill, has been one of the largest foreign investment projects in Ukraine in recent years. The opening of the entire terminal complex, including ship berthing areas and silos, was celebrated in autumn 2019 with a «Port Fest». For the construction of the new grain handling facilities, which are concentrated at Berth 24, Inros Lackner

provided the associated planning and design services, right up to and including detailed design. In addition, Inros Lackner designed three additional berths – nos. 14, 15 and 25 – as deep-water berths for bulk cargo and container handling.

From a construction point of view, the design of the deep-water berths, with water depth of 21.66 m and quay wall height of 1.71 m, was a particular challenge. Such a large difference in ground level is exceptional, and was unprecedented in Ukraine from a marine construction point of view. It required not only element lengths and construction types to be adapted to the design depth, but also the corresponding pi-

ling and dredging technology. In the end, the design was based on a combined crane way and piled wall cross-section, with piled steel pipes and rear anchoring – a solution that had already been successfully implemented several times in Yuzhny Port.

The project implementation required the planning of the heavy marine engineering work to be coordinated with the dredging work. As General Planner, the team provided the associated planning and design services, continuing to serve the client as technical consultant throughout the construction phase until acceptance and handover.



**Tobias Günzl, Head of Maritime engineering and ports**

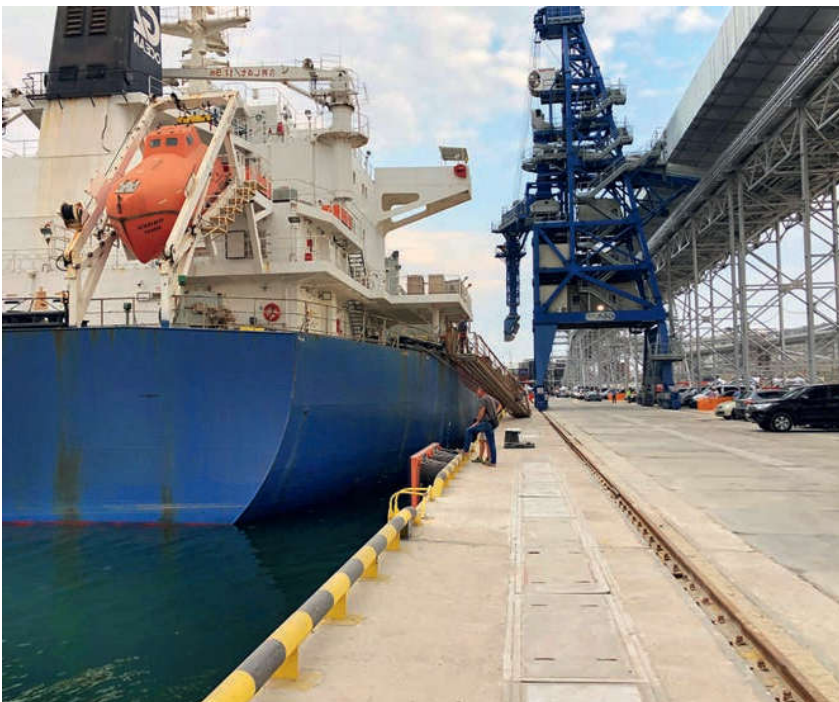
In the design and construction of the berths, Inros Lackner played a significant role in the expansion of Yuzhny Port. We are proud to have been able to advise the project team on site, and grateful for the client's trust in the competence and capability of Inros Lackner – and the project team in particular – to plan, design and move forward these complex berth construction works within a very short period of time.



**Notable construction aspects:**

- Construction of a 400m-long retaining wall with a reinforced concrete structure on top
- Retaining wall height of 23.37 m, with rear anchoring
- Permissible traffic loading of 100 kN/m<sup>2</sup> (= 10 t/m<sup>2</sup>) on the quay above
- Piling in rock-like ground
- Dealing with port-typical soft soils in the course of the dredging work

Berths 14/15 and 25 were designed on a similar basis, completing Yuzhny Port's quay renewal with deep-water berths.



Maritime engineering and ports



Port operations/ logistics



Maritime design



Civil engineering



Structural design



Project and construction management







# HAMBURG PORT AUTHORITY

Important economic engine for the whole of Germany

Since 2005, the Hamburg Port Authority AöR (HPA) has been the Port of Hamburg's control centre where everything comes together – an expert port manager, a public-law institution and a modern service enterprise with around 1,800 employees, all in one. On the port property of more than 7,000 hectares, the HPA gets goods and people moving by sea, road and rail. Together with its subsidiaries, Flotte Hamburg GmbH and Cruise Gate Hamburg GmbH, the HPA relies on innovative technology and intelligent solutions in implementing its pioneering port concept with greater safety, efficiency and ease of operation on all transport routes. As a real estate manager and client of important infrastructure construction projects – such as the globally unique Rethel double bascule bridge or the new Kattwyk railway bridge – the HPA contributes to the design of the cityscape and makes the port, over the entire value chain, an important economic engine for the whole country.

The duties of a port operator are many and varied – the HPA oversees and manages all shipping traffic in the port around the clock from the port's Nautical Headquarters. It also provides high-

quality infrastructure, e.g. in operating and maintaining bridges, locks, tunnels, roads, railway tracks and quay walls. Another important task of the HPA is the dredging work required to keep the port's shipping channels navigable at all times. The authority also markets its expertise in port management, and promotes Hamburg's port interests at national and international level.



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## Hamburg Port Authority AöR (HPA)

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[www.hamburg-port-authority.de](http://www.hamburg-port-authority.de)

## Services provided for the HPA

Inros Lackner has provided various planning and design services for the HPA and has been supporting projects in the Port of Hamburg for many years. These include, among others, the supervision of bank strengthening works at Lotsenhöft, the design and contract award of the Ellerholz lock bridge, and design services for the locomotive servicing area. Currently, we are assessing the condition of quay and banks walls, and supervising the renaturation of the Spadenlander Busch/Kreetsand disposal site for dredged material.





# ENGINEERS WITHOUT BORDERS

Improving living conditions,  
sustainably



We are glad to support the work of 'Ingenieure ohne Grenzen' (Engineers without Borders, Germany) in Tanzania. This year, our donation goes towards a project that promotes the expansion of basic school infrastructure in Mashati, east of Kilimanjaro. Using participatory methods, it is aimed to improve education levels in the region and thereby also the economic situation of the people.



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