



# *Special.*

Client magazine | 2016

## Developing and maintaining infrastructure

Roads - Railways - Waterways

Redesign of a road crossing in Hamburg

International Garden Exhibition 2017 in Berlin

National Assembly House in Hanoi

Port Project in Peru

**INROS LACKNER.**

Consulting Engineers & Architects



## Dear readers,

With increasing globalisation and the fast pace of modern life, and the resulting growth in traffic and travel, the demand for an efficient and sustainable road, rail and port network continues to increase. The demand for mobility is also constantly increasing, as are goods transport volumes. It is thus essential that roads, railways and waterways are not only maintained and further developed but also increasingly interconnected, in order to enable growing transport demands in the coming years to be properly catered for.

Integrated solutions are called for, which offer a desirable balance between the needs to ensure the mobility of people and goods, to use limited space wisely, to minimise noise emissions and to avoid environmental impacts. Read more about the various aspects of infrastructure development and maintenance in our cover story. What challenges and opportunities are associated with the development of infrastructure that is fit for the future?

And once again, we will tell you about some of our national and international projects.

I wish you a pleasant read!

Torsten Retzlaff, Director

Dr. Klaus Richter, Director



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## Meeting of HTG

Last year's meeting of HTG, the German Port Technology Association, was held in Bremen. It aims to provide an interdisciplinary exchange between the different players in the field of hydraulic engineering and port construction. Inros Lackner took part and presented four national and international projects. The range of topics included planning of flood protection in the historic surroundings of Bremen, development of an international sea port on the Caspian Sea in Turkmenistan, reinstatement of quay facilities at the cruise terminal in Warnemünde and modernising of Mombasa port in Kenya. During breaks, the Inros Lackner stand was a popular venue for the attending experts to meet. HTG and IL have been cooperating closely for the last several decades.

## 2015 Engineering Award of the German state of Mecklenburg-Vorpommern

Congratulations to the project team that earned the special praise of the jury of the Mecklenburg-Vorpommern Engineering Award, for the new parliament building of the Vietnamese government in Hanoi. The jury found that the project is excellently suited to enhancing the standing of the German engineering industry abroad, and that it exemplifies how aesthetic and engineering demands can be satisfied as one. The jury also stated that it was convinced by the project's likely sustained effect in promoting the commercial development of the engineers of Mecklenburg-Vorpommern. In joint venture with gmp Architects, the engineering specialists of Inros Lackner SE suc-

ceeded in planning and designing a public building that is both functionally impressive and aesthetically pleasing. One particular engineering challenge was posed by the fact that adequately load-bearing soil could not be found above a depth of approximately 35 m, while the seismic safety of the building also had to be ensured. The foundations consist of 187 bored piles with a diameter of 1 m and 413 bored piles with a diameter of 1.2 m, and a surrounding diaphragm wall, 1 m wide, with a depth of up to 40 m. For seismic protection reasons, the two main parts of the building are structurally independent of each other, each responsible for its own strength and stability.



## INROS LACKNER Togo

In October last year, our long-standing presence in Togo since the 1960s was re-established with the formation of the new INROS LACKNER Togo SARL branch in



(From left) Dr. Klaus Richter, Pouwi Léoudè-Eglou Kossi (Notary), Christian Esser, Ingo Aschmann

Lomé. This strengthened Inros Lackner's presence in the African market and expanded our capabilities there, enabling us to respond better to increasing demand. The company is being managed by the Christian Esser and Dr. Klaus Richter. Christian Esser, who grew up in Togo and has many happy memories of his childhood there, had long wished to return there. This wish started to become reality with his degree dissertation, "Planning of Lomé's seaport expansion", and he has been working for Inros Lackner in Togo since 2009. Apart from developing and expanding the Port of Lomé since 1960, Inros Lackner has also played a role in a number of other infrastructure projects in Togo.

One current example is the "Petit Contournement" bypass road in Lomé – details of which can be found on pages 31 and 32.

## German government Sustainability Award



Germany's largest construction research project, *C<sup>3</sup>-Carbon Concrete Composite*, has been awarded the German government sustainability award in the category "Research". The ambitious project, with more than 130 partners engaged in the research and establishment of carbon concrete as a new construction material, prevailed among 87 research projects. Inros Lackner is one of the partners in the innovative C<sup>3</sup> consortium, to which staff members contribute their know-how on the development and use of C<sup>3</sup> as a tensile force-transmitting and durability-increasing strengthening and protection system.



## Scholarships have been granted

”One half from the federal government, the other half from you“ – this is the slogan adopted by the Federal Ministry of Education and Research to promote the *Deutschlandstipendium* scholarship. From the very beginning, Inros Lackner has sponsored the *Deutschlandstipendium* scholarship and supported young engineering students in the new academic year at the University of Rostock and the University of Applied Sciences Berlin. At the annual awards ceremony, Mr. Ingo Aschmann, Executive Director, symbolically awarded the scholarships certificate to a student in the Information Technology and Computer Engineering Master programme. In Berlin, Mr. Hans-Jörg Niemeck, Executive Director, awarded the certificate to a student of civil engineering. In total, 52 *Deutschlandstipendium* scholarships have been awarded.

## New office space for INROS LACKNER Vietnam

At the end of last year, the grand opening of the new office space of the Inros Lackner Vietnam LLC subsidiary in Hanoi was held with more than 60 invited guests. The new premises next to the central railway station is more centrally located and offers more space for the growing number of staff. Welcoming addresses were held by Mr. Uwe Lemcke, Chairman of Inros Lackner SE and Mr. Torsten Illgen, Managing Director of Inros Lackner Vietnam LLC. A buffet, drinks and a live band rounded off the event. Since 2004, Inros Lackner has been implementing projects in Vietnam. In late 2007, In-

ros Lackner Vietnam LLC was founded in Hanoi to strengthen the presence in the Vietnamese market, further extend capacities and meet the increasing demand.



## Deep Water Container Port in Karachi

The port of Karachi is being developed into a deep water port. With the Deep Water Container Port mega-project, the Karachi Port Trust (KPT) is providing new capacities for 5th and 6th generation container vessels as of 2016. In the first phase, four new berths with a total length of 1.5 km will be constructed. Four STS container cranes and six rubber-tired gantry cranes (RTG) have been delivered for the first berth.

As part of this project, Inros Lackner has been assigned the task of Checking Engineer, and is responsible for site management and site supervision. For the concessionaire, South Asia Pakistan Terminals (SAPT), Inros Lackner is coordinating and supervising the integration of railway tracks and other special equipment into the quay facilities.

## Roads - Railways - Waterways

# MAINTAINING AND DEVELOPING INFRASTRUCTURE

The development of infrastructure on land and water is multifaceted with respect to structure and quality. Changing requirements and standards continually result in a need for more renovation and new construction. These requirements and standards are increasingly characterised by issues such as energy efficiency, demographic changes, sustainability and – in the modern era of globalisation – adapting mobility and versatility of people and goods. Efficient infrastructure is not only an important backbone of an economy; it also makes a strong contribution to the standard of living of the local population.

To ensure that infrastructure is developed in such a way that will meet future needs, the parties involved must grapple with the challenges posed by the need for sustainability. In discussion with Dirk Brandenburger, technical manager of DEGES (Deutsche Einheit Fernstrassenplanungs- und -bau GmbH – the company that was established by the German government, following the country’s unification in 1990, to oversee the planning and construction of motorways in the new federal states), the issues raised include the key elements of a project’s success:

What does success depend on? Where is there room to improve? City planning director Uwe Bodemann speaks about the work of city and transport planners and about future trends and current developments. Please find out more on the following pages.



## Developments in the field of transport infrastructure

# IN CONVERSATION



© DEGES / MIKA-fotografie.de

**Dirk Brandenburger**, qualified engineer and construction assessor, has been DEGES's Technical Director since 2006. Prior to that, he worked in the road construction departments of the German state of Rheinland-Pfalz and of the German federal ministry for transport – including as the head of the liaison department of the road construction department in Berlin. He is a member of the governmental initiated commission *Bau von Grossprojekten* to reform the way in which major construction projects are managed in Germany.

Mr Brandenburger, DEGES became known as the “motorway company of the new federal states”. What does its work involve today? DEGES was established in order to support these states in the planning and implementation of projects under the German reunification transport development programme. According to its charter, DEGES was to be wound up upon completion of this mandate. This remained the expectation for a long time, until it was realised that an enormous amount of experience and knowledge had been built up on many projects in a short period of time, and this should be retained. So the charter was changed in 2001, expanding DEGES's activities to include the planning and implementation of all kinds of infrastructure projects, including



road, rail and waterway, throughout the whole country. The constraints and objectives in our work have also changed considerably. For the reunification projects, the quickest possible completion of projects was a key objective, but today our work involves managing, in a complex environment, not only new construction projects but also, predominantly, upgrading and maintenance projects.

**In people's heads, DEGES remains strongly associated with highways. Are there new areas that are becoming a key focus in DEGES's activities?**

Roads remain very important, whether motorway, regional or rural roads. And necessary bridge renovations will become increasingly important and urgent in the coming years. The sector will have to prepare for this with specialist knowledge and with financial and human resources.

**What else has changed?**

In the 1990s we were strongly supported in our work by government policy, which had a focus at that time on quickly enacting legislation such as planning acceleration laws and on prioritising funding for reunification projects. And it should not be forgotten that our projects had strong support among the population of the

new federal states. Today, matters are much more complex. Developments in environmental law in the last 20 years alone demand much more detailed planning. For the planning approval of a linear transport infrastructure project, which will inevitably be subject to environmental laws, it is essential that environmental issues are dealt with efficiently and effectively. The obtaining of planning permission is a key project milestone. The participation of the affected population – and communication about projects – has also become a central aspect of our work. Often, in the wider industry, no resources are devoted to establishing this critical communication process for a new project – with the result that the participation of key project partners and of affected parties is inhibited, right from the start.

**Indeed, communication is an increasingly critical success factor during the life of a project. Another great challenge lies in thinking ahead. Is this also a key element of project success?**

Adequate resources must be devoted to the start of the process – the planning stage! Problems which are not adequately addressed in the planning stage should not be shifted to the construction stage. We have discussed this topic in detail in the *Bau von Grossprojekten* reform commission.

**And companies in the sector will be assessed in this regard? What is to be expected going forward?**

Yes, let's look to the future. Transport infrastructure demands are more likely to increase than decrease. Governments strive to provide the required funding, and in return, employer organisations must support the measuring of performance in implementing projects and in adhering to budgets and deadlines. But in many cases, personnel resources are limited. This applies not only to the administrative authorities but also to the engineering firms. This is one reason for those involved in projects to support each other better in the future. Reciprocal open and honest communication is a defining factor for success – but also a great challenge.

**You are active in promoting the development of projects on a partnership basis. How do you structure this process?**

An important tile in the mosaic is the guidelines of the VBI (German association of consulting engineers), in which we have together defined the elements of collaboration. The guidelines represent a paradigm shift in construction work and contract execution. Engineering firms – on whom we rely during the planning, design and construction phases – must fully grasp this. They are like an extension to our arm. We need colleagues that are willing to work with us in a spirit of partnership. The guidelines are an important start, but these must be built upon through consistent application in practice.

**What expectations do you have of your partners?**

At DEGES we intentionally limit ourselves to a management role, and work closely with engineering firms and consultants in the areas of planning/design and construction monitoring. We need competent partners who understand the industry. The fact that we at DEGES do not undertake construction monitoring tasks with our own personnel will not change. But we do notice significant differences in performance levels – in Germany we have very good planning and design firms, and experienced planners and designers, but very few

who have what it takes to manage construction contracts and monitor construction to the same standard. So I would call on engineering firms to develop greater competence in this area.

**What has been your experience with the awarding of contracts**

*>> I would call on engineering firms to develop greater competence in the management of construction contracts and in construction monitoring.<<*

**based on “most economically advantageous” criteria rather than based purely on price?**

It is the structures that we have to look at. For large contracts, we follow a sophisticated system. We make an initial selection based on general references and other evaluation criteria. Then the tenderer must successfully come through detailed contract discussions. In these, we place a key focus on the personal qualifications of the management. Another important consideration is the actual availability of the team and the project managers on site. We will want to have the same people on site that we got to know during the contract discussions. But unfortunately, contracted engineering firms sometimes change the personnel because another project has gained in importance. This is not acceptable to us. Another problem we have been facing recently is that it is sometimes difficult to even get several tenders for a contract involving construction monitoring and management of construction contracts.

**Many thanks for the discussion, Mr Brandenburger!**



A3 autobahn, Lahntal Bridge, Nürnberg – Aerial photograph © Hajo Dietz



## Urban and transportation planning in Germany

# EVER CHANGING CITIES



### City planning director Uwe Bodemann

has managed the public works department of the city of Hanover, capital of the state of Niedersachsen in northern Germany, since 2008. Before that, he served as building director in the government of the German state of Bremen, and in various roles in the city development and environment authority of the state of Hamburg.

**Mr Bodemann, cities are finding themselves under pressure to develop. Issues such as overloaded and ageing infrastructure, changing demand structures, sustainability and demographic changes are on the agenda. What challenges are facing urban and transportation planners in the city of Hanover?**

Demands on city infrastructure are constantly changing due to factors such as demography and climate protection, a new orientation towards urbanity in the city centre and other parts of the city, changing mobility offerings and habits, and future expectations relating to living, working and recreation. We are facing up to these challenges in Hanover – for example, by developing future-proof concepts such as the city centre concept Hanover City 2020+, the Mobility 2025 master plan, and the Wohnkonzept 2025 living concept.

**The project Hanover City 2020+ and the Mobility 2025 master plan currently form the basis for the city's further development. What short- and medium-term urban and transportation planning measures will have priority in the coming years?**

The successful implementation of our concepts can already be seen in the Klagesmarkt and Am Hohen Ufer parts of the city. The positive urban development of the city centre will be continued at other locations (e.g. in the Am Marstall, Schmiede Street and Köbelinger Markt areas), and in other parts of the city. The building of apartments to meet demand and the renewal of transport infrastructure also have priority. In the coming years, multi-modal transport systems will be further developed in order to meet gro-

wing, changing mobility needs. Worthy of special mention is the development of cycle traffic, which is to grow to 25% of total traffic by the year 2025.

### What future trends are on the horizon?

In the course of socio-political and urban structural processes, demands relating to living and mobility are continually changing. The age of the mobile Internet brings with it changes in how mobility may be accessed. Flexible, diverse offerings in urban areas and locally available modes of multi-modal transport are becoming ever more popular.

### How can the available financial resources for this be best used?

Financial resources will be first dedicated to the renewal of existing infrastructure. Intelligent systems will be increasingly used to optimise the use of existing structures and resources. Private companies will be encouraged to participate in public projects.

### Can you give us a brief insight: How will the city of Hanover look in 2025, with its future-oriented transport system?

Attractive public streetscapes and squares make it pleasant and safe to move through the city. City districts will be nice places to stay and spend time. The principle of handicapped-accessible short-distance mobility by foot, by cycle and by public transport will be implemented in the coming years. Environment- and climate-friendly modes of transport, such as foot, cycle and public transport, will grow considerably, contributing to substantial reductions in air and noise pollution.

In the framework of the city dialogue “My Hanover 2030”, citizens can discuss future city development challenges with local and external experts. One element of this is the whole subject area of mobility and transport. An event was held on 6th July 2015, for example, with the title “Smart mobile”, in which future-oriented mobility issues were discussed. ■





**TRADE FAIR TRAIN STATION, HANOVER**

Planning and design of Europe's largest passenger railway station at the time. Trade fair visitors were initially served by trains on 8 tracks, later on 10.



*In 2002, the transportation and logistics departments were integrated.*



**1993**

*The environmental planning and design department was established.*

**1965**

**1972**

**1994**

**MOTORWAY FEEDER ROADS, CITY STREETS, BRIDGES**

From the planning stage to construction monitoring – services from a single source in Wilhelmshaven.



*More than ten ferry docks have been designed since 1990*

**RO-RO FERRY LOADING RAMPS**

In 1994, a new generation of combined Ro-Ro ferries was introduced to serve the route between Lübeck and Helsinki. For the Vorwerk port in Lübeck, berths with double ramps for stern-side loading and unloading of ferry ships, at both the upper deck and the main deck levels, were designed.





### BERLIN-HAMBURG MAGNETIC LEVITATION TRAIN (TRANSRAPID)

The Inros Lackner – Obermeyer joint venture was responsible for the preparation of the preliminary design and of planning approval documentation in the Mecklenburg-Vorpommern section.

Environmental Impact Study | Route optimisation (detailed routing) | Ecological reports | Landscape conservation management plan | Land acquisition register | Management of planning approval process | FFH impact study

### A20 AUTOBAHN

Construction of Germany's longest continuous new autobahn since 1945 began in 1992. At the end of 2005, the last section was completed and the motorway was opened to traffic. For this outstanding road construction project, various planning, design and construction monitoring services were provided for three sections.



→ **42 KM** LENGTH OF THE THREE MOTORWAY SECTIONS FOR WHICH PLANNING AND DESIGN SERVICES WERE PROVIDED

1995

1996

> > > > 2005

2002

### KAISER LOCK, BREMERHAVEN

It is the biggest project of its kind in Europe. A new lock is constructed to replace the original Kaiser Lock, the construction of which was completed in 1897 and which together with the North Lock provided access to the international port of Bremerhaven. As part of a joint venture, Inros Lackner provided planning and design services in the preliminary design stage, and the company was also contracted to provide consultancy services to the client during the construction and design review stages.

**Lock gate data:** height 23 m | width 55 m | weight 2,200 t

- **305 m** LENGTH OF THE NEW LOCK
- **455,000 m<sup>3</sup>** EXCAVATION
- **55 m** PASSABLE WIDTH OF THE NEW LOCK



„The construction of the new Kaiser Lock is a project of enormous importance for the Bremen ports and for those who participated. The project is a shining example of national and international developments in the fields of shipping and related technology.“

Klaus Richter, Managing Director

**KARACHI HARBOUR CROSSING**  
**Connection of port to highway network**

In a joint venture with Leonhardt, Andrä & Partner, a south-west bypass of the city of Karachi in Pakistan was planned and designed. A key element of the project was a cable-stayed bridge with a clear height of 68 m, a main span of approximately 470 m and a total length of 870 m.



**BRENNER BASE TUNNEL**

As part of the joint venture Planungsgesellschaft Brenner Basistunnel (PGBB), Inros Lackner SE is responsible for route and equipment planning and design on the Austrian side. Services provided included alignment and defining of all relevant railway tracks, roads, waterways and services (cabling, pipework, etc.), and the design of engineering structures (bridges, retaining walls) outside the tunnel.



© Brenner Basistunnel BBT SE

**7250 km/h** PASSENGER TRAIN SPEED

**7400** ADDITIONAL TRAINS WILL BE ABLE TO TRAVERSE THE BRENNER  
 AXIS EACH DAY

**756 km** TOTAL LENGTH OF THE TUNNEL



**PEDESTRIAN AND CYCLE BRIDGE**  
**STATE ENGINEERING AWARD**

The bridge over the B106 highway was the first GRP bridge on the German highway authority's network. High bending strength and excellent corrosion and chemical resistance characterise this material, as do its low weight and its ability to be quickly and easily installed.

**STRUCTURE DATA:**  
 Individual spans: 15 m, 30 m,  
 Width between railings: 2.5 m  
 Crossing angle: 100 gon



*Over 1,000 bridges newly de-  
 signed, renovated, construc-  
 tion-monitored, inspected*



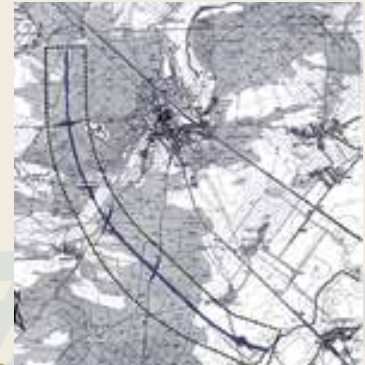
### IMPROVEMENT OF ACCESS TO HAFENCITY IN HAMBURG

The Ferdinandstor traffic junction is redesigned to increase its capacity and to optimise traffic flows. Read more about the project on pages 14 and 15.

Planning (outdoor installations, engineering structures, traffic facilities) | Structural design

### A14 AUTOBAHN

The new section of the A14 autobahn closes an existing gap in the German federal highway network between Schwerin and Magdeburg. Planning and design services have been and are still being provided for various elements such as the carriageway, rainwater retention basins and crossing structures.



*Kilometres of autobahn for which planning and construction monitoring services have been provided since 1991 (approx.):*

**258.5 km**

2010

2014

since 2005 >>

2015

2016

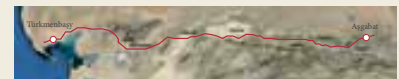


### RECONSTRUCTION OF THE PÖPELMANN BRIDGE

The 300-year-old arch bridge, which crosses the Vereinigte Mulde river in the German town of Grimma, was destroyed by severe flooding in the summer of 2002. The primary objective in designing the replacement structure was to find a compromise, capable of being granted planning permission, between the historical ideal of the Pöppelmann Bridge and the need to survive future flooding.

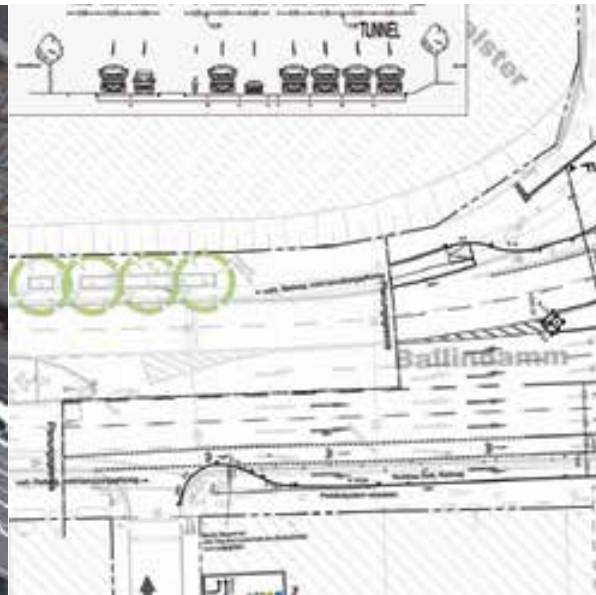
2015

*Contract for 550 km of highway in Turkmenistan*



→ **INDIVIDUAL SPAN WIDTHS:** 19.42 – 20.40 – 71.00 – 16.48 – 15.70 = 143 m

→ **BRIDGE SURFACE AREA:** 1043.9 m<sup>2</sup>



## Redesign of a road crossing in Hamburg

# IMPROVEMENT OF ACCESS TO HAFENCITY

As residential and commercial use of property in Hamburg’s *HafenCity* development continues to increase, so too do traffic volumes in the area. This increase in traffic has strongly impacted on the Ferdinandstor junction, which has recently been undergoing modification works as part of a wider project to improve access to HafenCity. The junction is located in the city centre, between the Inner Alster and Outer Alster lakes, and is an important east-west connection on the Wallring inner ring road. In addition to the large volumes of motorised traffic that use the junction every day, it is also traversed by many cyclists (important cycle routes) and pedestrians. Inros Lackner was contracted by the roads, bridges and waterbody authority (LSBG) of the city of Hamburg to plan and design the modification works.

### Objectives and constraints

An assessment of the current high traffic volumes and of the projected future traffic increases made clear that it was absolutely necessary to redesign and upgrade the junction to improve its efficiency and optimise traffic flows. The principle objective of the work was to create an efficient

junction for all modes of transport and all users. In order to minimise construction-related disruption to traffic, LSBG favoured planning the work to be carried out at the same time as the necessary rehabilitation works at the nearby Wallring Tunnel. These rehabilitation works included changes to the roadway’s cross section and its clear height, and were to be appropriately considered in the junction’s redesign.

### Optimisation of lane layout

As part of the junction modification works, the traffic lane layout has been redesigned, with new lanes added, in order to improve turning possibilities. Traffic signaling is also being completely renewed, using the most up-to-date technology. In future, it will be possible to coordinate the junction’s traffic signaling with that of the Wallring Tunnel and other nearby junctions, enabling emergencies in the tunnel to be better responded to and allowing traffic flows to be managed more efficiently. For example, in case of an emergency in the tunnel, all entrances to the tunnel can be immediately closed and the signals at the exits can be set to remain green until the tunnel has been fully evacuated.

### Public cycle traffic

Cycle traffic facilities are also being improved to make them more efficient. In the area of the junction, in accordance with the so-called “Berlin model”, cyclist routing is on the carriageway. This will increase driver awareness of cyclists, and thus improve traffic safety. In addition, the cycle lanes and cycle paths will be wider and otherwise improved. This will also benefit pedestrians, who have had to share less space with cyclists in the past. Traffic routing will now be safer for both. The improved signaling controls will also ensure that cyclists and pedestrians can cross the junction without interruption.

Overall, this inner city junction will also be greener. Although the work requires eight trees to be removed and four others to be re-located, 35 trees will be newly planted.

### Challenging construction-phase traffic management

The planning of traffic management for the construction phase presented as big a challenge as the design of the final works. In cooperation with the Hamburg firm BKP, Inros Lackner planned a properly functioning



Traffic layout drawing

traffic management scheme, with due consideration of the ongoing rehabilitation works at the Wallring Tunnel and other construction projects in the area. Each construction phase was agreed and planned in detail. The city marathon, Cyclclassics and other major sporting events had to be considered, since these would take place while construction was going on, and would be routed through the construction area. On the basis of the preliminary plans of the Hamburg firm WES LandscapeArchitecture, Inros Lackner also developed the planning and design of the external facilities of the

art gallery, tendered the work, and coordinated the planning and design work with the other work that was being planned in the area. By bringing together the various construction activities, the impacts on traffic could be comprehensively considered and the duration of the impacts minimised. The prescribed tight time-frame necessitated open communication among all project participants, and efficient management of all interfaces. The construction work commenced in March 2015, and is expected to be completed in early 2016.





## New teaching and research building for inclusion pedagogy

# ARCHITECTURE AS A SYMBOL OF HETEROGENEITY

This project represents a significant success in the field of research and university construction. For the teaching and research specialisation “Inclusion Heterogeneity”, a new building was constructed at the University of Potsdam at a cost of approximately 5.1 million euro. The building’s opening was celebrated last October. With a floor area of 950 m<sup>2</sup>, it provides six professors of inclusion pedagogy and the research group “heterogeneity and inclusion” with various working rooms, a teaching laboratory and a laboratory for experimental empirical research with EEG cabins, force measuring plate, eye-tracking and 3D movement analysis system. There are also two large seminar rooms for the students. The entire building was constructed to be accessible (for wheelchairs, etc.) in accordance with DIN 18040.

In its design, the building responds to the external area in the contrast between its façade’s materiality and the surroundings. A HDMI-LED screen is recessed into the Cortain steel façade to promote interaction. This innovative façade design of the building, a shimmering shell of varying rust tones, is a symbol of heterogeneity,

of the diversity in a school with an inclusive approach. Here, all children, including those with disabilities, should be nurtured according to their needs and abilities. The building is exemplary for the architecture of school buildings. The main entrance is notably set back for easier orientation, and extra-wide doors can be easily passed through by wheelchair. The black colour of the doors creates a strong contrast to the white walls and the signal-red floors, assisting visually-impaired people in finding their way.

All rooms are signed in Braille writing. The seminar rooms are equipped with acoustic technology for people with hearing disabilities. The LED screen, with an area of 15 m<sup>2</sup>, has great potential for varied uses in the external area – such as for live transmission of lectures or events, even from other university campuses. The fully-built Institute for Inclusion Pedagogy was recognised as exemplary architecture at the German architecture industry’s 2015 Day of Architecture, where it was presented to an interested public.

*Architect Dr. Haie-Jann Krause*





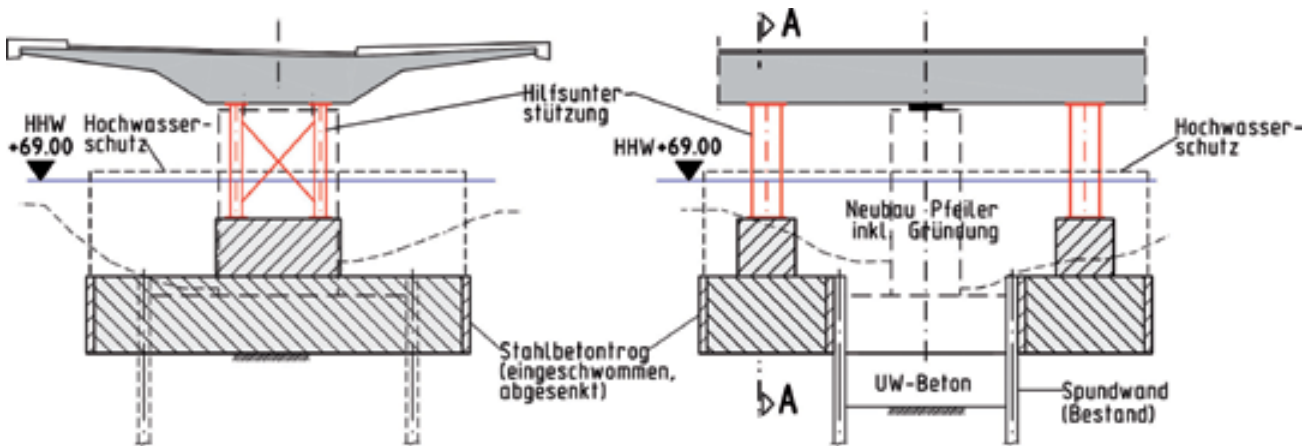
**General planning:**  
INROS LACKNER SE

**Architect:**  
Dr.-Ing. Arch. Haie-Jann Krause,  
INROS LACKNER SE

**Client:**  
BLB Regionalbereich Baumanagement Süd-Ost

**Planning:**  
October 2013 - May 2014

**Construction:**  
May 2014 - March 2015



Concept sketch showing replacement of the central pier of the Spree Bridge

## Diagnosis: “Concrete cancer” DEMOLISH OR REPAIR?



ASR-damaged central pier of the Spree Bridge



Abutment of the factory railway bridge, with added splash-water protection

Many existing concrete structures exhibit increasingly serious defects, such as netlike open cracking, efflorescence and spalling, well before their theoretical service life has been achieved. One reason for this is often a chemical reaction which destroys the concrete’s microstructure and thus impacts on the fitness for use and the loadbearing capacity of the structure. This process is known as alkali-silica reaction (ASR, also known colloquially as “concrete

cancer”). ASR is caused primarily by the use of unsuitable aggregates and secondarily by the presence of moisture. ASR can be avoided in new construction by following the ASR guidelines of the German reinforced concrete committee (Deutscher Ausschuss für Stahlbeton, DAfStb), for example. In the case of existing structures of concrete with reactive aggregate, ASR cannot be “cured” but its effects may be minimised. Whether or not ASR-damaged structures or structural elements must be demolished depends primarily on the residual expansion capacity (an indication of the progress of the chemical reaction), the expected remaining service life and the feasibility of reliably preventing future exposure to moisture.

On a bridge which was built in 1980 over the River Spree in eastern Germany, the piers in the river exhibited numerous cracks of over 1 mm in width, which could be attributed to ASR. Based on the test-confirmed high residual expansion capacity and the permanent exposure to moisture of the piers, it was determined that it would be sensible to replace the damaged piers and their foundations. The work could be carried out under traffic thanks to the use of temporary supports. Due to the structure’s changed static system it was necessary to verify the design of the heavily trafficked, highly loaded three-span prestressed concrete bridge of length approximately 70 m, considering the proposed renovation technology.

That it is not always necessary to demolish ASR-damaged structural elements is illustrated by the example of a two-span factory railway bridge that was built in 1975. Widespread concrete spalling and netlike surface cracking at the abutments could be attributed, following testing of the concrete, to ASR. In this case, it was possible to extend the service life of the structural elements by preventing the structure from becoming wet and implementing a monitoring scheme.

*Dr. Ronny Glaser*



## Building services equipment for exhibition building GRIMMWELT IN KASSEL

After just two years of construction, Grimmwelt opened on time for the Kassel Museum Night. Since then, visitors have been delighted by the new building and its interactive exhibition. Grimmwelt (or Grimm World) is part of the Brothers Grimm Museum, and is located on the south slope of the Weinberg hill in Kassel, in a heritage-protected and inviting park landscape. Inros Lackner was responsible for the technical building services equipment of the exhibition building, which comprises approximately 2,650 m<sup>2</sup> of floor space, 2,000 m<sup>2</sup> of roof space and 1,600 m<sup>2</sup> of exhibition space.

The new museum preserves the park's special atmosphere, which is characterised by old stone steps, wall remains and green terraces. This special landscape topography is continued in the exhibition building, which, as a sculpture that can be walked across, leads visitors to the roof terrace. The external form is reflected internally in the split-level floor arrangement, which is ideal for a fairytale wander through the exhibits. On the ground floor are located the main foyer as a central entrance area, visitor services, a café, a multifunctional area and the administration. Special exhibitions and the museum's educational area are located on the first floor, and at the upper basement level there are exhibition areas (Brothers Grimm fairytales). At the lower basement level, further exhibition areas (cosmos, laboratory, treasure chamber, connection module), storage rooms and building services are housed.

*Christian Meinecke*

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### FACTS AND FIGURES

- 22.8 km of power cable
- 18.6 km of data cable
- 14.7 km of telecommunication cable
- approx. 60 external lamps to create special lighting effects
- approx. 2,800 m<sup>2</sup> of terrazzo floor was laid
- approx. 22,500 m<sup>3</sup> of building volume
- approx. 890 t of Grauinger Travertine limestone were used, including approximately 370 m<sup>3</sup> of stones, 2,100 m<sup>2</sup> of façade, 500 m of block steps and 260 m of parapet wall.

### SERVICES COVERED:

- Lifts
  - Telecommunications / IT technology
  - Heating plant
  - Industrial refrigeration
  - Cooling technology
  - Measuring and control technology
  - Low voltage engineering
  - Ventilation and air conditioning
-

## Tourism master plan – Gardens of the World extension

# INTERNATIONAL GARDEN EXHIBITION 2017 IN BERLIN

From 13th April until 15th October 2017, Berlin will host the International Garden Exhibition (Internationale Gartenausstellung, IGA) – the biggest international garden festival in Germany. The IGA premises will cover an area of approximately 100 hectares, including the Gardens of the World in Berlin-Marzahn, the wooded Kienberg hill and part of the Wuhle Valley in the northeast of the city. In 2017, a new cable car connection will offer an exciting means of entering the handicapped-accessible exhibition area, with panoramic views over the premises. The company Grün Berlin GmbH, which is implementing the tourism master plan – Gardens of the World – on the way to the IGA festival, contracted Inros Lackner, following a competition procedure, to provide planning and design services in relation to the engineering structures and the technical equipment. The contract

also included construction monitoring services for the areas on the Kienberg hill and in the Wuhle Valley, and for the extension areas in the Gardens of the World. The extensive planning and design tasks were completed for all areas in 2014/2015, and the construction monitoring engineers have been working on site since early 2015. In parallel, supplementary coordinated services plans are being created.

### A tourist attraction of international appeal

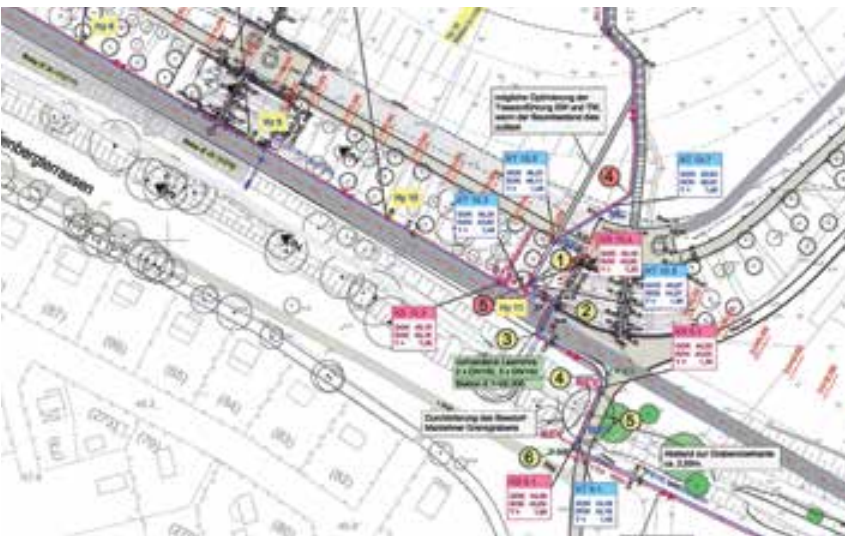
The modifications made in accordance with the tourism master plan will be retained after the IGA has ended, helping the property, with the extended Gardens of the World and the new Kienberg park, to develop into a unique rest and recreation area and a tourist attraction of international appeal. The new park landscape is being



Ropeway Blumberger Damm, © Leitner Ropeways and Kolb Ripke Architekten



IGA premises, © Contempo



Design extract



financed by both federal and state funding under the German “Verbesserung der Regionalen Wirtschaftsstruktur” (“improvement of the regional economic structure”) programme, and is being co-financed by the senate department for urban development and the environment. The budgeted investment is approximately 49 million euro.

**Long-term and temporary usage**

Particularly interesting for the design team working on this project were the multifarious consultations with various specialists such as architects, surveyors and other engineering firms. Since the implementation of a major project – such as IGA 2017 – is a dynamic process that continues until the opening, new ideas are always arising, and these must be considered in the technical designs. Focal points include wastewater disposal and water supply for the new buildings and facilities, and the design of all high-voltage and low-voltage power equipment. For the dimensioning of all media networks, future requirements were estimated in consultation with our clients and other involved specialists – on the one hand considering long-term demands and on the other, the temporary demands during IGA 2017.

Inros Lackner was previously responsible for the technical designs for IGA 2003 in Rostock, for the state garden show in Nordstedt in 2011 and for the 2013 International Garden Exhibition in Hamburg.

*Dr. Marion Radegast*



## Landmark building **DESIGN COMPETITION FOR GREIFSWALD CITY ARCHIVES**

Inros Lackner participated in a Europe-wide design competition for the new Greifswald city archives building. Set back, but with an imposing design, the building and the public courtyard in front of it stimulate curiosity and invite passers-by to visit the public areas on the second floor, via the spectacular stairway gallery, and enjoy the lovely views of the Mühlen suburbs and the Ryck lowlands. The building's external shape stems on the one hand from the concept of archiving, with robust, packed shelves, while at the same time calling to mind, with its façade structure, the region's peat cutting history. A modern public stairway gallery, inspired by the historical archive stairs, leads visitors to the second floor level. The slightly raised courtyard repeats once again – by the use of trench-like landscape elements – the idea of the old peat cuttings.

*Architect Torsten Illgen*







Volkswagen Arena, Wolfsburg



Audi Centre, Frankfurt

## The real estate service provider in the Volkswagen Group

# INNOVATIVE AND CUSTOMISED REAL ESTATE PROJECTS

Volkswagen Immobilien (Volkswagen Real Estate) offers a wide range of services. For over 60 years, this subsidiary has been serving the German car giant's needs for worker accommodation, and since the end of the 1990s it has also been active in the areas of commercial real estate and property services. Today, the company's portfolio is more diverse than ever before, and includes apartment rentals, selling of residential properties, management of commercial real estate, project development, project execution, rental contract management, asset management and facility management.



### Major projects and urban "space savers"

In recent years, a number of major projects have been successfully executed. These include, for example, parts of Volkswagen's Autostadt visitor attraction with the luxury Ritz Carlton hotel in Wolfsburg, an automobile design centre for the company in Potsdam, a research and development centre in Isenbüttel, the Volkswagen Arena football stadium in Wolfsburg, several projects for Volkswagen AG's logistics department and various dealer properties for different group marques. The area of dealer properties is a key element of Volkswagen Immobilien GmbH's commercial business, and a focal point is the network of service locations in large urban areas. Developments on city properties of limited dimensions call for efficient and economical designs. One example of such a "space saver" project is the Audi Centre in Frankfurt, which was built as a multi-level structure. The Audi property in Berlin-Adlershof has a total gross area of approximately 20,500 m<sup>2</sup>, split among three buildings and



VW logistics centre, Braunschweig



an exhibition tower of height approximately 30 m. Modern projects were also executed for Skoda's and Volkswagen's commercial vehicle sections. Current highlights include the two Porsche Centres that are being built in Berlin and Munich.

>> In the whole of Germany, no other company has developed and realised so many dealer properties of different marques as Volkswagen Immobilien. << Roland Stöckigt, Managing Director (Spokesman) of Volkswagen Immobilien GmbH

#### Sustainable construction

For Volkswagen Immobilien, the sustainable construction of energy-efficient dealer properties is an important issue which is the focus of special attention under the "Blue Building" concept. With the associated standards relating to property outfitting, energy usage and use of raw materials, real estate projects are executed in a long-term ecologically friendly and even more resource-saving way.

Thinking today about developments that will be in demand on the market tomorrow – that is important to Volkswagen Immobilien in further developing itself as an innovative, committed and fair global player.

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#### Planning and design work for the VW logistics centre, Braunschweig

On a premises of area approximately 150,000 m<sup>2</sup>, Volkswagen Immobilien, as both owner and investor, constructed a new logistics centre. Inros Lackner was responsible for the project in the role of General Planner. The main building, with an area of approximately 50,000 m<sup>2</sup>, was built to bring together the 13 previously existing storage facilities of Volkswagen's Braunschweig works. In February 2014, planning permission was granted and construction commenced. By Autumn 2014, just seven months later, the structural work was completed, and the building was opened in May 2015. The construction of the complex used over 13,000 tonnes of reinforced concrete. The total area of façade, at approximately 9,300 m<sup>2</sup>, is about 25% larger than a football field, and approximately 90 kilometres of electrical and data cables were laid.



DRIVE Group Forum, Berlin

© VW Immobilien



Exterior View National Assembly House © Christian Gahl

## New parliament building for Vietnamese government NATIONAL ASSEMBLY HOUSE IN HANOI



Top: Base slab of the Main Meeting Hall  
Bottom: Internal view © Christian Gahl

In an international competition, the partnership of gmp and Inros Lackner prevailed and was awarded the contract to provide complete planning and design services for the new parliament building of the Vietnamese government. Inros Lackner designed the earthquake-proof main structure and planned and designed the technical building services.

### A round eye-catcher: Main Meeting Hall

The heart of the building is the parliament's round Main Meeting Hall, which, with a diameter of 51 m and a height of 26 m, is supported by eight columns at a height of 9 m. It has room for approximately 1,100 people. This hall is at the centre of the building's quadratic floor plan, and is surrounded by a five-storey structure containing a banquet hall, foyer and reception areas and office space. For seismic protection reasons, the main meeting hall and the five-storey structure are structurally independent of each other, and are only connected by bridges. The building also has two basement levels with exhibit areas, a museum and building services rooms.

### A "spoked wheel" as a base slab

The base slab of the Main Meeting Hall (MMH) is of reinforced concrete and constructed in the shape of a spoked wheel. The composite columns which support this base slab are arranged beneath a 1.75 m-high outer ring. From this ring, eight radially oriented beam pairs connect via an intermediate ring to an inner ring with a diameter of 10 m. The 1.6 m-high interior of the hall's floor structure was constructed as a hollow chamber system with top and bottom solid slabs. The air conditioning system of the hall and of the foyer beneath it is integrated in the base slab. The

MMH's eight vertically protruding support columns pass through the two basement levels to the deep-founded foundation slab, and are laterally supported by the floor/roof slabs of the basement levels.

#### Dome roof with steel supporting framework

The dome-shaped roof of the Main Meeting Hall consists of a steel supporting framework with a covering of 25 cm-thick prefabricated reinforced concrete elements, the joints between which were subsequently filled. The steel supporting framework, with a diameter of 50 m, has, in its lower and upper areas, two stiffening rings. It is supported by 32 pinned bearing points on reinforced concrete projections from the MMH's outer wall. In addition to their load-carrying function, the eight composite columns of the MMH must also be capable of withstanding the high forces that may arise in an earthquake. Each column has a steel core of a welded I-beam with supplemental plates added, with the dimensions 2,660 mm x 900 mm, a length of 16.3 m and a weight of 78 tonnes.

*Ralph Prüfer*

GFA: 60,000 m<sup>2</sup>

Dimensions: 102.5 m x 102.5 m

Construction Cost: 195 million euro

Design: 02 / 2009 – 12 / 2012

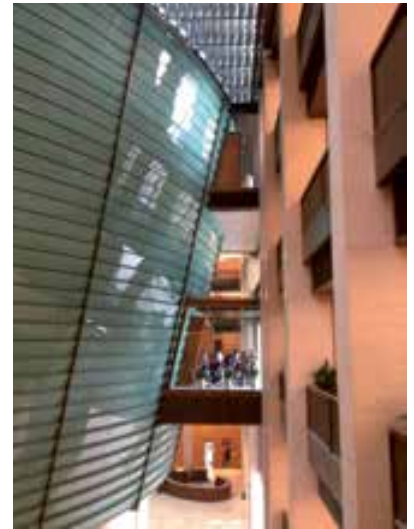
Execution: 06 / 2010 – 10 / 2014



Roof structure



Connection to Main Meeting Hall



Internal view of Main Meeting Hall © Christian Gahl



## Modernising of a key port to meet future demands

# MOMBASA PORT, KENYA

The Port of Mombasa on Kenya’s Indian Ocean coast is the largest port in East Africa. Besides its domestic importance, the port is also the main gateway to several landlocked neighbouring countries. Since 2005, transport demand across all port sectors has been growing strongly, leading to congestion and delay at the port. It was thus necessary to create additional capacity and to improve services. Furthermore, much of the infrastructure was outdated and there was a need to replace or modernise facilities in order to be able to accommodate larger vessels of even Post-Panamax size. Inros Lackner was commissioned by the Kenya Ports Authority to undertake a study of how the port’s infrastructure might be improved, enabling it to meet future demands.

As part of the project, Inros Lackner and the local associate Gauff Ingenieure assessed both the maritime infrastructure (Berths 1 to 18, Lighter Quay, Mbaraki Wharves) and the onshore infrastructure, and developed proposals for appropriate rehabilitation and modernisation work.

The project comprised the following elements:

- Condition survey of the quay wall (total length approx. 4,000 m) and backlog areas and associated facilities (roads, railway lines, cargo handling equipment, warehouses, storage areas)
- Assessment of the loadbearing capacity of the quay wall
- Rehabilitation, strengthening and deepening of the quay wall
- Review and updating of traffic forecasting
- Bathymetric survey
- Environmental Impact Assessment
- Rehabilitation of the port’s pavements, roads and the railway system
- Improvement of road and rail access to the port from surrounding areas
- Improvement and rehabilitation of the drainage and stormwater system
- Improvement of the overall port layout





## Firefighting Academy, Kuwait

# DEVELOPMENT AND DESIGN

The Kuwait Fire Service Directorate (KFSD) is planning the development of its training centre into a state-run academy. National and international fire services training and further education will be provided here, in a central location. As part of a consortium including Profinet GmbH, the German Fire Protection Association and the local firm Jassim Qabazard Engineering Consultants, Inros Lackner won the internationally tendered contract and is now su-

pervising the development and new construction of the firefighting academy. In a first step, a feasibility study was performed, and based on this, a master plan was created for the development of the study programme and the new construction of the academy. In the next step, Inros Lackner will manage the tendering and contract award phases, and the technical building equipment will be adapted to suit the particular requirements of fire services training.



## Renovation works in “Puerto del Callao” port PORT PROJECT IN PERU

The seaport of Callao borders on the Peruvian capital city, Lima, and they together form an important economic agglomeration – the port is one of the country’s most significant sea and trade ports.

“Already on our first long journey from Miraflores-Lima to Callao, the taxi driver told us that the port of Callao was one of the richest ports during the 20th century. Every port worker earned so much that he or she could afford the luxury of hiring another person to do the tedious and physically demanding work, and that person could hire a third person. And each person in this chain really earned something in the end.”

### Development into a highly efficient megahub port

In the past, not enough was invested in maintaining the port’s infrastructure, which has thus become old and, in part, badly damaged. It became necessary to carry out renovation works in order to maintain the port as a principle gateway for the import and export of goods of all kinds. The national port authority, APN, granted concessions for the south terminal (DP World) and the north terminal (APM Terminals). In addition to port operation, DP World and APMT are also responsible for upgrading the infrastructure. The goal is to transform the Port of Callao into one of the most efficient megahub ports on the west coast of South America.





### Renovation of quay and LPG landing pier

The project included, among other elements, the renovation of Quay 7 for fossil fuels – the renovation of an LPG (liquefied petroleum gas) landing pier to maximise the reliability of unloading operations. The terminal handles 35 percent of the total gas needs of Lima city, and covers the entire kerosene supply needs of the international airport, located just five kilometres away. APM Terminals engaged Inros Lackner to plan and design the renovation work and to manage the tender process. During the inspection works, divers identified considerable damage to the port infrastructure. 30 percent of the piles and 60 percent of the platforms are damaged.

Furthermore, the current protective fender system is badly damaged. It does not comply with any international standard and is thus not suitable for docking ships. In planning the renovation works, a number of options were developed, considered and evaluated. The preferred option includes for the raised walkways to be largely renovated and for the firefighting system to be completely renewed, located on a special platform. Construction is anticipated to commence in mid-2016, and to be completed in early 2017.

*Manuel Morandeira*

## Less heavy traffic in the city centre LOMÉ BYPASS, TOGO

Properly functioning infrastructure is critical for the positive development of a country, including its economic growth and its export orientation. In addition to the development and extension of Lomé's seaport since 1960, Inros Lackner has also managed various other infrastructure projects in Togo, such as the current construction of a seven kilometre, four-lane bypass road in Lomé. The KFW-financed road construction project is connected to the construction of a 15 kilometre drainage network to prevent flooding during heavy rainfall. The small "Petit Contournement" bypass, with a total length of 15 kilometres, connects the port with the northbound national highway (Route Nationale N01). It has the role Properly functioning infrastructure is critical for the positive development of a country, including its economic growth and its export orientation. In addition to the development and extension of Lomé's seaport since 1960, Inros Lackner has also managed various other infrastructure projects in Togo, such as the current construction of a seven kilometre,



four-lane bypass road in Lomé. The KFW-financed road construction project is connected to the construction of a 15 kilometre drainage network to prevent flooding during heavy rainfall. The small “Petit Contournement” bypass, with a total length of 15 kilometres, connects the port with the northbound national highway (Route Nationale N01). It has the role of reducing heavy traffic in Lomé’s city centre. Inros Lackner was responsible for the planning, design and construction monitoring of the second section of road with a length of 7.7 kilometres. The project commenced in August 2013, and the bypass was officially inaugurated in December 2015.



### SERVICES

- Geotechnical investigations
- Surveying work
- Traffic counting
- Drainage study
- Routing study
- Dimensioning of the surface build-up
- Environmental impact study
- Tender evaluation and contract award
- Construction inspection

## Clean water and light for learning with ENGINEERS WITHOUT BORDERS

The dedication of the aid organisation’s staff and volunteers casts a different light on the work of engineers. Functioning water, energy and sanitation systems are things we take for granted, but this is not the case in many other countries. The staff of Engineers without Borders and volunteer members, engineers, economists and social scientists go to these countries and address acute infrastructural problems, improving the living conditions of the people there.

**Mr Rolke, as a project coordinator you oversee various projects. How is your work perceived, both here and in the country where the work is being done?**

The feedback is good and appreciative. We are predominantly active in rural areas where water supply, sanitation and energy supply systems are lacking. There is also great interest among sponsors, which we value.

**Are projects assigned to you, or do you go in search of projects to be involved in?**

Both – there are very many project requests, from all over the world, including Germany. First and foremost, it is aid organisations that come to us and tell us about

problems that need to be addressed. Then we assess whether or not the project is suitable for us and if it can be implemented.

**How does such an assessment go?**

Right at the start, the project idea is communicated, and then follows a fact finding mission. We meet the project partners and the people that would be affected by the project, and learn more about the need and the requirements.

We evaluate the material costs and quality and the logistics. Based on these different criteria, the viability of the project idea is assessed.



**Steffen Rolke**

*is the head of project coordination at Ingenieure ohne Grenzen (Engineers without Borders Germany). He studied economics and has worked in the areas of climate protection, renewable energies and economic development on various projects in Germany and abroad. He has been working with Ingenieure ohne Grenzen since 2008.*





© Ingenieure ohne Grenzen

### Which criteria have priority?

It is important to us that we understand the living circumstances of the people on the ground right from the start, so that we can devise solutions that are both efficient and beneficial. This means, for example, that we use local and national products where possible and practical. Enquiries in relation to donations of materials – such as solar panels

from Germany, for example – are assessed with respect to usability and availability. We don't want to introduce "aliens" for which future replacement or repair work will be problematic. Our goal is to organise projects in such a way that they can be taken on and managed independently after a certain planning and operational period.

[www.ingenieure-ohne-grenzen.org](http://www.ingenieure-ohne-grenzen.org)



© Ingenieure ohne Grenzen

## Distance does not eliminate responsibility!

(Manfred Hinrich)

### Member of Engineers without Borders

As a nationally and internationally active company, in addition to our project work, the transfer of specialist knowledge and social involvement play important roles in our activities in other countries. We don't want to close our eyes to the societal situation in the countries in which we are working.

Through our membership of Engineers without Borders, we wish to support the work of this charitable aid organisation and also to sponsor specific individual projects. In addition to our membership, for example, we are supporting, with a donation, a water supply project in a village in Cameroon. We are delighted to follow the progress in this project to develop a piped water supply system in a country where we are also active as a company.

## A recipe from Togo

# MOYO

*Grilled fish with spicy tomato sauce*

### INGREDIENTS

- 3 whole tilapia, or gilthead bream (fish)
- 8 ripe tomatoes
- 3 Spanish onions
- 1/4 white cabbage
- 4 cloves of garlic
- Fresh ginger (according to taste)
- 2 habanero pods or 4 chili pods
- 2 Maggi cubes
- Salt and pepper according to taste

### PREPARATION OF THE FISH MARINADE

*Blenderize three tomatoes, a Spanish onion, two cloves of garlic, a habanero pod or two chili pods and a Maggi cube in a mixer and add salt, pepper and ginger to taste. Fry the puréed ingredients in peanut oil and reduce to a marinade.*

### PREPARATION OF FISH

*Gut and scale the fish. Cut a notch in the fish and fill with the marinade, and generously baste the fish with the marinade by brush. Then grill the fish on both sides, repeatedly basting with more marinade.*

### PREPARATION OF THE TOMATO SAUCE

*On a chopping board, cut five tomatoes, two Spanish onions, the white cabbage, two cloves of garlic, a habanero pod or two chili pods, and some ginger into small cubes. Sauté the ingredients for approximately 20 minutes in peanut oil and reduce to a sauce. Add salt, pepper and a Maggi cube to taste.*

### RECOMMENDED AS A SIDE DISH

*Rice, plantains or yams (African potatoes)*



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