Hamburg ahead

INTERNATIONAL BUILDING EXHIBITION HAMBURG

A hill of new horizons
The Georgswerder Energy Hill

December 2013

IBA_HAMBURG Building the City Anew

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Content

A Introduction

The "Georgswerder Energy Hill" is opening up new prospects for the city. Having been made safe, the landfill site has become a landmark for the Elbe Islands and a symbol of the transformation that has taken place through the use of old sites and new forms of energy. It is a lighthouse project, producing sustainable energy and literally acting as a beacon for the district. As such, it not only fits the IBA key theme of "Cities and Climate Change" but also exemplifies the "Metrozones" key theme, through which the International Building Exhibition (IBA) Hamburg is bringing inner-city peripheries back to life. The "Energy Hill" is also opening up new prospects for Georgswerder in terms of urban planning policy.

For decades the landfill site in Georgswerder was not open to the public – a large gate blocked the entrance to the 45 hectare area. Since the 1960s, it had been Hamburg's main waste disposal site. In the 1980s, improperly stored hazardous waste led to the Georgswerder dioxin scandal.

From 2010 onwards, the landfill mound was gradually opened and made accessible to the public as part of the IBA Hamburg. This once-closed area was reintegrated into the city.

Since 2011, the exhibition housed in the information centre and a wide range of tours run by the IBA Hamburg have focussed on the "Energy Hill". In 2013 the gained access and the Horizon Footpath was opened, offering views over Hamburg and the Elbe Islands from its 40 metre summit.

Fig. 1: The former landfill site in 2008 before the transformation into the Energy Hill

A.1 “Renewable Wilhelmsburg” Climate Protection Concept

The IBA’s “Renewable Wilhelmsburg” Climate Protection Concept, developed in 2008, involves a markedly decentralised approach to 100% renewable forms of energy within the city.

The route towards making the Elbe Islands climate-neutral was set out in the 2010 ENERGY ATLAS. The Climate Protection Concept is supported by four strategic pillars:

- Improving the energy efficiency of the buildings
- New buildings with high energy efficiency
- Decentralised heat networks based on renewable and locally generated energy (including industrial waste heat)
- Production of renewable forms of energy within the district

The first steps towards this goal have now been taken, with over sixty completed IBA energy and construction projects. Once the “Energy Bunker” and its deep geothermal energy system have been completed in 2015, over 50% of the buildings on the Elbe Islands with electricity, and every seventh building with heating, will be able to receive heat generated by renewable energy or combined heat and power.

The research project “EnEff:Stadt – IBA Hamburg” is overseeing the planning of all of the IBA projects up to 2015, measuring energy flows, investigating user behaviour and offering advice on optimising performance. This makes urban planners and developers aware of the concepts, experiences and outcomes of the IBA, as well as opening them to the public. Energy monitoring data are displayed on a multimedia table in the exhibition at the “IBA DOCK”.

Work is also being carried out on continuing and transferring the project to other parts of Hamburg and other European cities. The “Renewable Wilhelmsburg” Climate Protection Concept was one of the model schemes analysed in the research project TRANSFORM – Transformation Agenda for Low Carbon Cities (EU 7th Framework Programme for Research, www.urbantransform.eu), in which the IBA, HAMBURG ENERGIE and the State Ministry for Urban Development and Environment participated as partners from Hamburg.

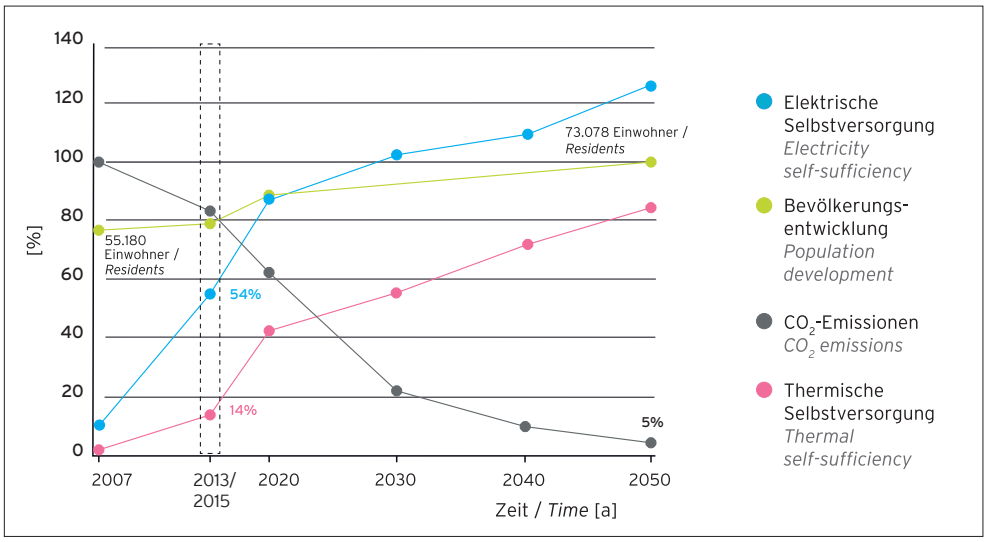


Fig. 1a: Excellence projection from the Energy Atlas: Future Concept Renewable Wilhelmsburg

A.2 History of the Energy Hill

Rising out of the Elbe Valley, between the slightly raised land on the northern bank of the Elbe and the Harburg Hills, the mound of the Georgswerder landfill can be seen from afar. The landfill site is located in Georgswerder, in the northeastern part of the Elbe island of Wilhelmsburg, and it borders on highly diverse urban and landscape areas.

Before World War II this locality was meadows and pastures, scored through by an old silted arm of the Elbe and drainage ditches. People started to deposit rubble here in 1948, followed by household and bulk waste. From 1967 the landfill site was also used for industrial waste. Ground basins were laid out within the household refuse area, with the express intention of storing liquid hazardous waste. A facility for solid and paste-like hazardous waste was also created. A total of 200,000 tonnes of highly toxic refuse from the chemical and oil industries thus came to be stored at the site.

By the 1960s Georgswerder had become Hamburg's main waste treatment plant. The hill grew, and by 1979 it comprised 14 million cubic metres of rubbish. As a result of subsidence and microbial degradation, today the volume of the site is only 7 million cubic metres.

After waste deposits came to an end in 1979 the landfill site was systematically returfed. There

Fig. 2: The landfill in operation (1967-1974)

Fig. 3: Fire basins at the landfill, ca. 1970

were plans to create a public green space with leisure facilities such as a bathing pond and a ski lift. However, problems soon arose due to landfill gases, which greatly damaged the vegetation on the mound.

In November 1983 the discovery of dioxin (as at Seveso) in the waste oil that was seeping out of the foot of the landfill mound led to the "Georgswerder Scandal". As a result, the reclamation plans fell through, and the site was earmarked for cleaning up.

Many different methods were employed to secure the Georgswerder landfill site between 1984 and 1995. These included re-capping it with a synthetic sealing sheet and capturing and using the landfill gases. Since then, the follow-up treatment and monitoring of the site and its technical facilities have been handled by employees from the Environmental Protection Department of the State Ministry for Urban Development and Environment. Leaking fluids are absorbed within a controlled system and treated, purified and subsequently discharged into the public sewer system via a multi-stage processing plant.

In 1992 the first wind turbines were installed on the summit to provide on-site power for the landfill. The site was designated as an "Energy Hill" for generating power as part of the IBA Hamburg.

Fig. 4: The landfill is made safe, 1986

Fig. 5: Cross-section of the covering, at least 2 m thick

B Energy Hill Project Details

B.1 Architecture and Landscape Planning Competition

Fig. 6: Wishful thinking or imminent reality? Photo montage for the competition

It is intended that the "Georgswerder Energy Hill" will serve as an informative venue where viewing points and an exhibition about the history of the landfill will raise public awareness of the way in which old sites are handled, and the potential for renewable forms of energy. At the same time, it is important to provide details of the dangers that lie beneath the landfill mound even today.

As a site that showcases energy generation and has fantastic views over the harbour and the city skyline, the "Energy Hill" will provide the public with new perspectives in both a literal and a figurative sense. By encountering different ways of harnessing energy, from wind, sunlight and landfill gases to geothermal energy, the site will offer visitors a stimulating experience.

In 2009 the IBA Hamburg, in conjunction with the State Ministry for Urban Development and Environment and in close cooperation with the Georgswerder Working Group, launched an architecture and landscape planning competition. This focussed on a design for the old Georgswerder landfill site, which would now be made accessible to the public. Entries were to address the challenge of providing a sensory experience as well as artistic, independent approaches to providing the "Energy Hill" with a distinctive design.

The architectural aspect of the task comprised the design of the operations and exhibition building.

The terms of the competition for designing the "Georgswerder Energy Hill" placed great emphasis on involving the experts who have observed the development of the "hill" for years, documenting changes, making them particularly well placed to assess its development. From the very outset, the competition task featured intensive preparation with regard to its content and the use of specialist advice, as well as a detailed list of parameters and planning restrictions. . In order to ensure close communication between the experts and the landscape planners and architects involved, it was decided that the competition would be single-stage and cooperative and would be restricted to particular entrants, with an early Europe-wide selection procedure. The international participants became well acquainted with

Fig. 7: Presentation of the designs, 2009

the landfill site and got to grips with the technical and spatial context. There were also myriad opportunities to discuss the designs with members of the jury and experts, in particular in relation to feasibility.

The contest was also a success in terms of its collaborative process, as a number of very different yet practicable designs were submitted in compliance with the essential restrictions.

The following companies took part:

- Schweingruber Zulauf Landschaftsarchitekten, Zurich, with Gramazio & Kohler, Zurich
- club L 94 LandschaftsArchitekten, Cologne, with Holzer Kobler Architekturen, Zurich
- LATZ+PARTNER Landschaftsarchitekten Planer BDLA OAI Lux, Kranzberg, with Studio Andreas Heller GmbH, Hamburg
- Breimann & Bruun, Hamburg, with Dinse Feest Zurl Architekten, Hamburg
- HÄFNER / JIMENEZ, Berlin, with Konermann Siegmund Architekten, Hamburg
- lohrer.hochrein landschaftsarchitekten bdla, Munich, with springmeier-architekten, Braunschweig
- Mutabilis Paysage & Urbanisme, Paris, with COBE architecture, Paris
- RMP Stephan Lenzen Landschaftsarchitekten, Hamburg, ,with JSK Dipl. Ing. Architekten, Hamburg.

On 15 May 2009, the jury, chaired by Professor Ulrike Beuter (Oberhausen) finally came to a unanimous decision to select the design by the HÄFNER / JIMENEZ team (Berlin) for landscape planning and Konermann Siegmund Architekten (Hamburg) for the construction of the building.

B.2 Landscape Planning Concept

Fig. 8: Energy Hill with the finished Horizon Footpath, 2013

New landscape planning for the secured Georgswerder landfill site was devised by the firm of architects HÄFNER / JIMENEZ as part of a competition. It was necessary to approach the technical structure in a way that addressed its nature as a brownfield site and its appearance within the landscape.
In particular, it was vital to take aspects such as visitor information, natural spaces that require protection, and sensory parts of the site into consideration.
Thanks to an open-space concept, parts of the previously inaccessible space have been opened up to interested visitors.
In addition to the exceptional panoramic views of Hamburg's skyline and the surrounding landscape, the concept piques interest in the history of the landfill site and its redevelopment, as well as the theme of renewable forms of energy.

The key feature of the design is the Horizon Footpath, an elevated 900 metre circular route. The path acts as a viewpoint over the city and the surrounding area.
The Horizon Footpath is a level track on a contour line (approx. 37.35 metres above sea level). The varying terrain clearance is bridged by supports of different lengths. The resulting appearance of the surface thus traces the topography of the hill. Showcasing the landscape in this way allows a greater appreciation of the shape of the hill when it is seen from afar.
The width of the path varies from 3 to 6 metres, with the widest sections featuring visual references to particular views and encouraging visitors to linger on the "Energy Hill". It has been shown that almost 90% of visitors follow the simple route markers along the Horizon Footpath.
In terms of technical engineering, the laying of the foundations for the Horizon Footpath presented a particular challenge, as the hill's protective covering could not be pierced, with the result that the foundations could not lie any deeper than 1 metre. In order to prevent damage,

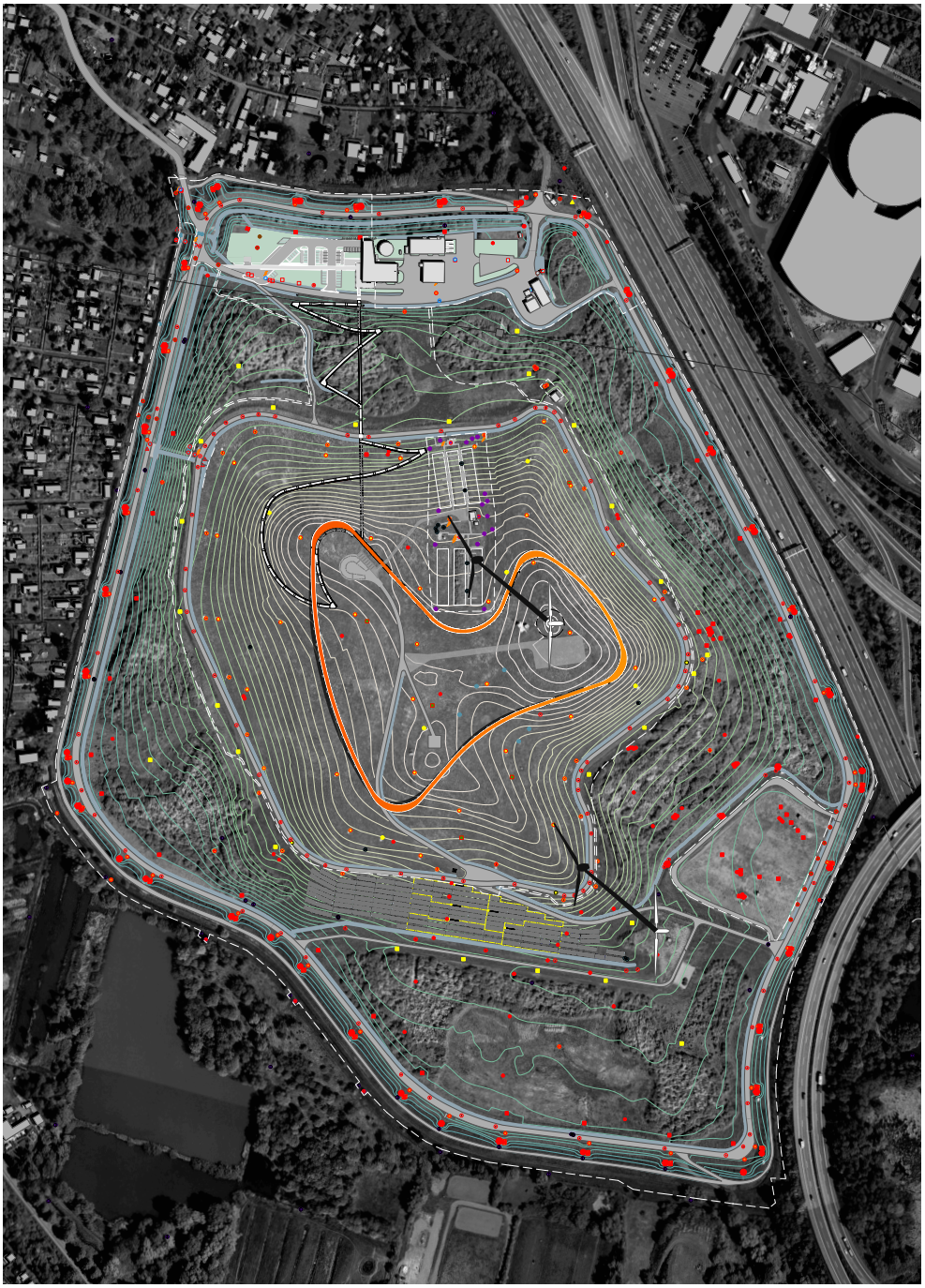


Fig. 9: Layout of the Horizon Footpath (orange). To the north is the information centre

Fig. 10: The last element of the Horizon Footpath is lowered into place, 2012

intensive ground surveys were carried out before construction, as part of a diploma thesis. About 130 benchmarks were fixed to the Horizon Footpath in order to determine and compensate for the slight ongoing subsidence in the area. Special devices allow the footpath to be adjusted to a uniform level.

For a few hours every night, the path appears as an illuminated white ring, and has become a new landmark in the city. The path's handrail contains energy-efficient LEDs. The light is reflected by the perforated plates of the path's side panel, making the new symbol of the "Renewable Wilhelmsburg" Climate Protection Concept visible all over Hamburg each evening.

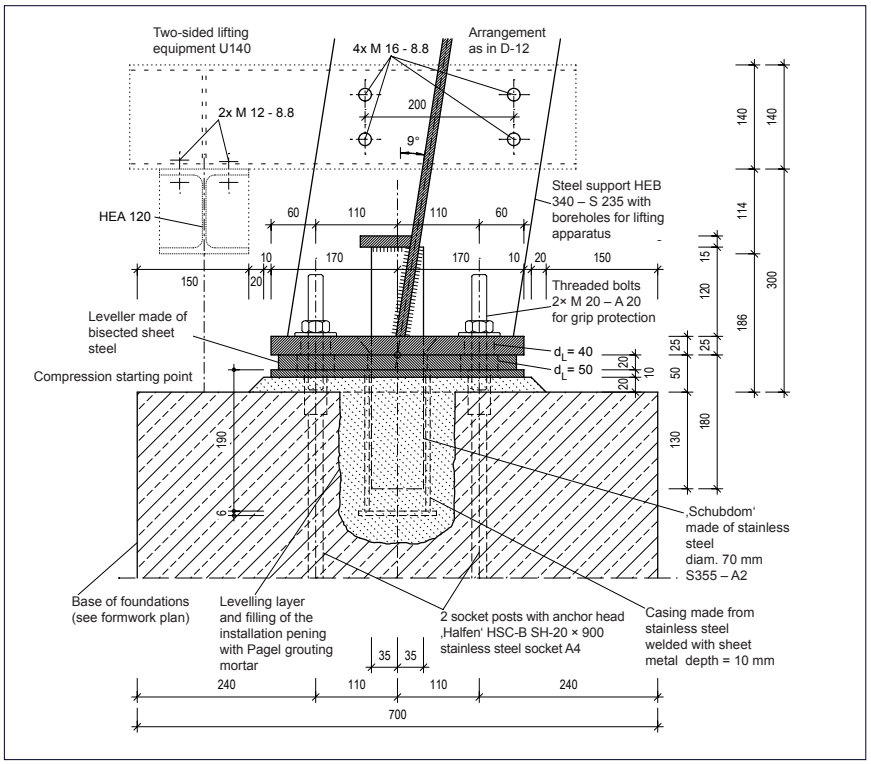


Fig. 11: Foundations and alignment of the supports

Fig. 12: Perforated metal plates on the inner side

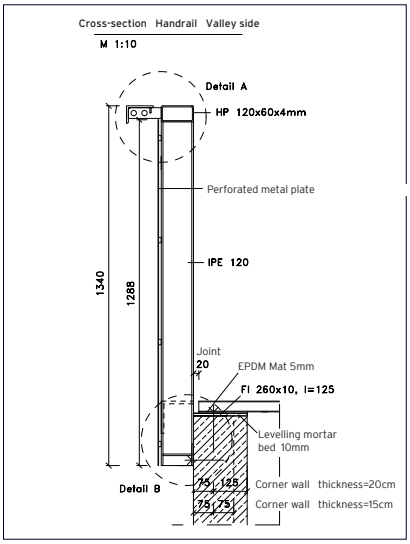


Fig. 13: Parapet with handrail

Fig. 14: Illuminated handrail, 2013

The construction of the Horizon Footpath took place alongside efforts to open up the area and the creation of infrastructure for visitors. These measures included a visitor car park with 33 parking spaces, including two parking spaces for people with disabilities, and an additional unit with toilet facilities. Two paths start from the information centre and lead visitors onto the hill – the accessible path and the short cut with 145 steps. These paths cross one another several times, allowing visitors to switch between them.

The areas of the site that are not accessible to the public are protected by new, inconspicuous fences, with the visible surfaces planted with greenery in places. All of the site's technical facilities, such as ducts and wells, have been made safe, so that they are unexposed and do not represent any danger.

In 2013 HÄFNER / JIMENEZ won the ICONIC Award Design Prize from the Design Council in the Special Architecture category for the Horizon Footpath on the "Energy Hill".

Fig. 15: The short cut taking walkers directly to the summit

Fig. 16: The accessible path swings out further, crossing the short cut several times

B.3 Architectural Concept for the Operations and Exhibition Building

Fig. 17: Situation at the start of the project, in 2008: in the foreground are the cabins housing the landfill offices, with the water purification area behind

The key urban construction idea behind the design for the operations and exhibition building, drawn up by Konermann Siegmund Architekten, is a close spatial relationship between the new building and the existing water treatment plant buildings. The operations facilities and the new building thus form a compact group, with an imposing appearance around the western entrance area.

The building that had previously been used as the office for the landfill site was demolished. Short distances were built into the operating process, allowing the existing operational facilities to be conceptually incorporated into the exhibition. With an area of around 350 square metres, the new building adjoins the existing premises of the groundwater treatment plant, so that the technical/measuring equipment and water tanks can be seen from the exhibition space. This gives the visitors an insight into the ongoing complexity of maintaining and securing the landfill.

As an IBA condition, the architectural design had to comply with high energy standards. The result is a structure that rates 50% below the 2007 energy conservation regulations (EnEV). The new building is heated by a water heat pump that uses the purified groundwater. The energy necessary for operating the site is generated by the photovoltaic unit on the south-facing roof areas of the adjoining space and the neighbouring building. Room heating is provided by an underfloor heating system. In addition, a thermal solar unit provides drinkable and hot water.

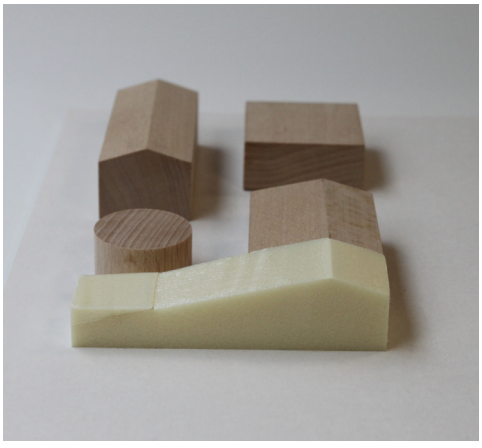


Fig. 18: Shape model for the information centre

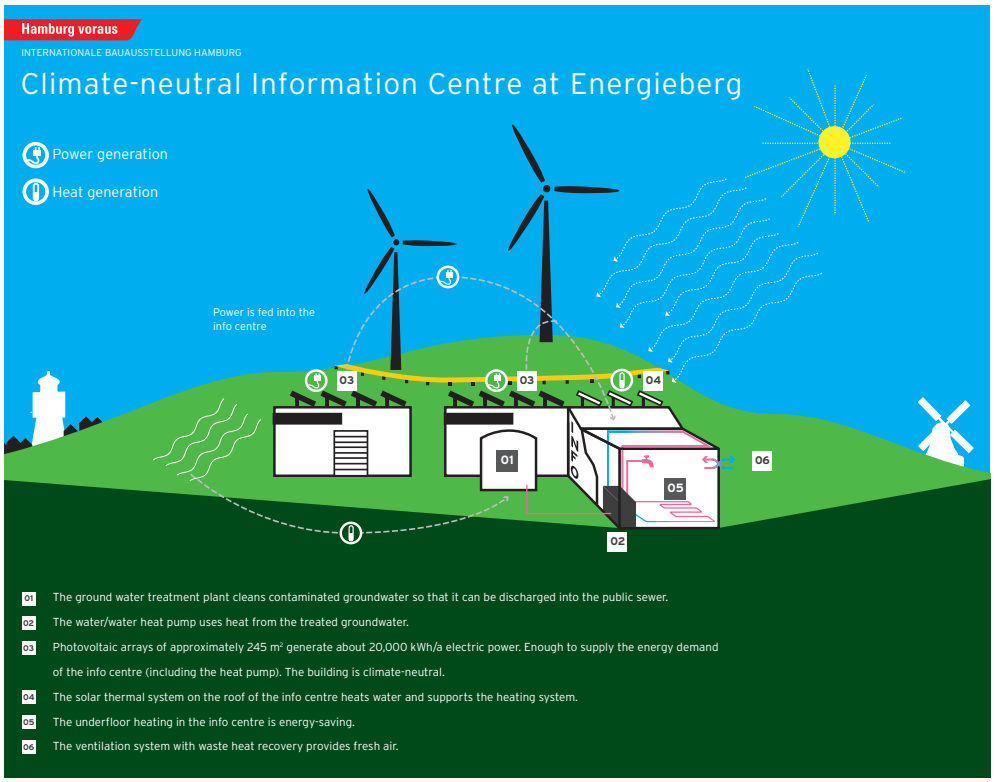


Fig. 19: Infographics for the information centre

The operational part of the building is supplied with fresh air by a mechanical intake and exhaust air unit. In the summer months the office rooms can, of course, be ventilated using the windows. The exhibition and seminar area is ventilated all year round. Natural ventilation via the windows is automatically regulated by carbon dioxide and temperature sensors. The building is supplied with energy by photovoltaic units mounted on the south-facing roof areas of the adjoining hall 4 and existing building 3. This makes the building climate-neutral when it is in operation.

The information centre was built in timber frame construction with an aluminium and expanded metal façade.

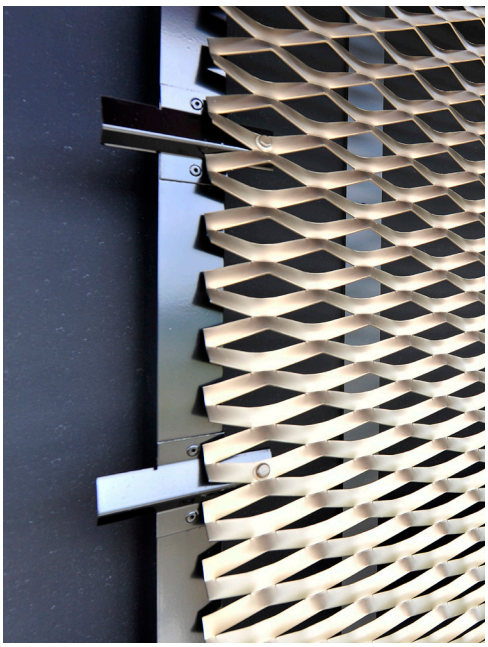


Fig. 20: Detailed view of the expanded metal façade

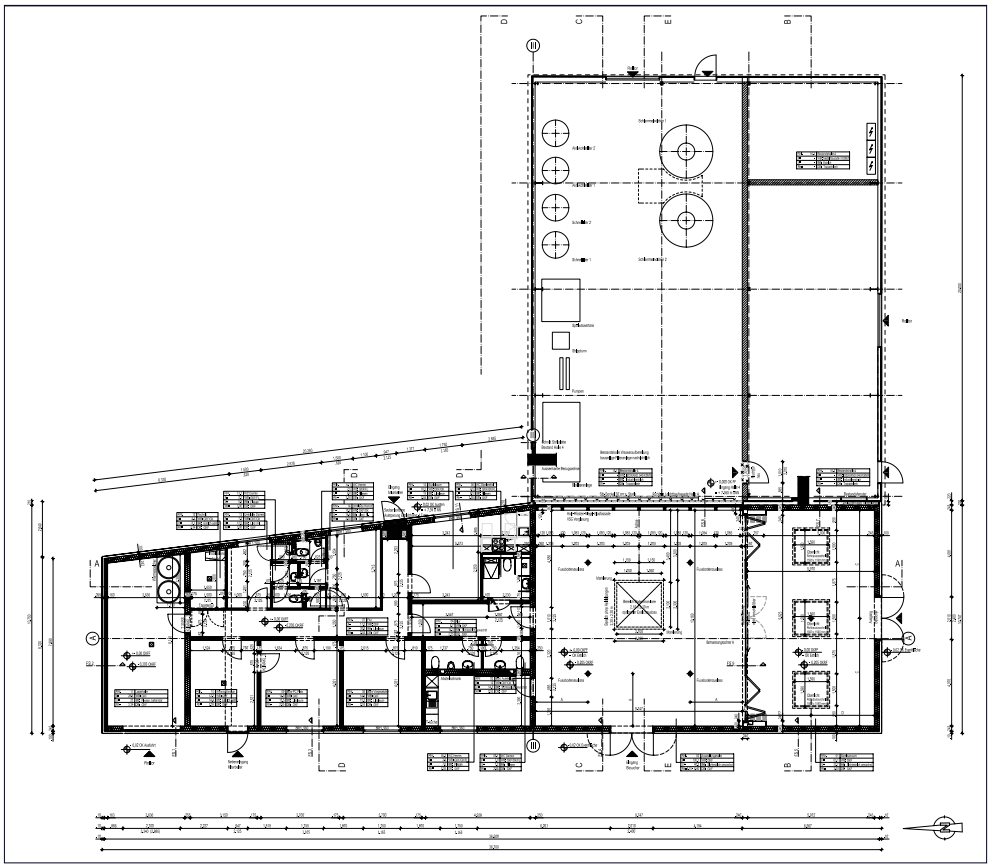


Fig. 21: Layout of the information centre, with the operations area and rooms

Fig. 22: The finished information centre, 2013

B.4 Exhibition Concept

Fig. 23: Exhibition and multimedia show in the information centre, 2012

In 2011 a restricted competition, involving seven companies, was held by the State Ministry for Urban Planning and Environment and the Soil Conservation Agency, in conjunction with the IBA Hamburg, to decide on the exhibition design. The jury was looking for an original exhibition idea that would be sustainable in the long term, and would be distinctive in its simplicity, while also addressing the complexity of the site in its content and spatial, didactic and design-related approach.
In terms of content, the exhibition was to focus on the long history of the landfill and the problems that needed to be overcome, as well as offering a view into the future and communicating the theme of land recycling and the long-term energy supply provided by the "Energy Hill".
The exhibition's target group encompasses people of all ages and interests: experts and general visitors; nursery, school and senior groups; and members of the public from the surrounding region and further afield.

The first stage of the competition sought to find solutions to the concept and design tasks. The following agencies were invited to take part in the first stage:

- BFGF Design Studios, Hamburg
- mgp ErlebnisRaumDesign GmbH, Hamburg
- Bertron Schwarz Frey Kommunikationsdesign, Berlin/Ulm
- complizen Planungsbüro, Halle/Berlin
- Impulsdesign, Erlangen
- raumtaktik, Berlin
- raumlaborberlin, Berlin

In the second stage four teams were given the chance to expand on their concepts.
Ultimately, the exhibition concept drawn up by the Hamburg-based firm mgp ErlebnisRaumDesign was chosen, against the Berlin-based companies raumtaktik and raumlabor, plus Bertron Schwarz Frey from Berlin/Ulm.

Fig. 24: Computer terminal in the information centre

The main element of the exhibition is the multimedia show "The Tamed Dragon". Three moving screens, floor monitors and dynamic light and sound effects are used to tell the story of the hill in a 13-minute film.
Together with the outside area, which features an unobtrusive visitor guidance system, the information centre, the Horizon Footpath and the "Energy Hill" itself combine to form a total experience. The exhibition is enhanced by panoramic displays on the Horizon Footpath and a printed "hill guide".

Spatial Experience and Individual Elements

The exhibition space is centred on a topographical model that represents the hill, offers an insight into the underground area (on ground monitors) and provides information about the "Energy Hill" at five info points. The installation is intended to pique visitors' curiosity, inviting them to walk around, and works with the connected platforms to form a kind of arena focused on a large model of the "Energy Hill" and the screens for the show.
The interplay between the show and the other informative aspects of the exhibition gives it a special feel. The film explains the history of the site with facts and emotive images. The toxic landfill is represented metaphorically as a dragon, making the "Georgswerder Energy Hill" into an evocative symbol.
As the multimedia show is presented in a very dramatic and serious style, there is also a two-minute film that explains the history of the "Energy Hill" for children. The information centre thus makes an interesting trip for families and preschool groups.

A monitor will be added to the exhibition in 2014, showing the current energy production values for the "Georgswerder Energy Hill".

Fig. 25: Children's film, 2012

STAGES OF THE REALISATION AND OPENING OF THE EXHIBITION

1st stage: Energy Hill – Firstly... (August 2011): Construction of a preliminary section of the exhibition and of the operations building (to open up the building and as an external info point for the Green Capital Hamburg 2011). Could be visited on IBA Hamburg tours.

2nd stage: Energy Hill – Secondly... Completion of the whole exhibition in the exhibition and operations building. Could be visited on IBA Hamburg tours

3rd stage: Energy Hill – Thirdly... (March 2013): Completion of the outdoor exhibition. Accessible during opening hours and on IBA Hamburg tours.

Fig. 26: Temporary exhibition, 2011: Energy Hill – Firstly...


Fig. 27: Horizon Footpath with signs to guide visitors, 2013

B.5 Energy

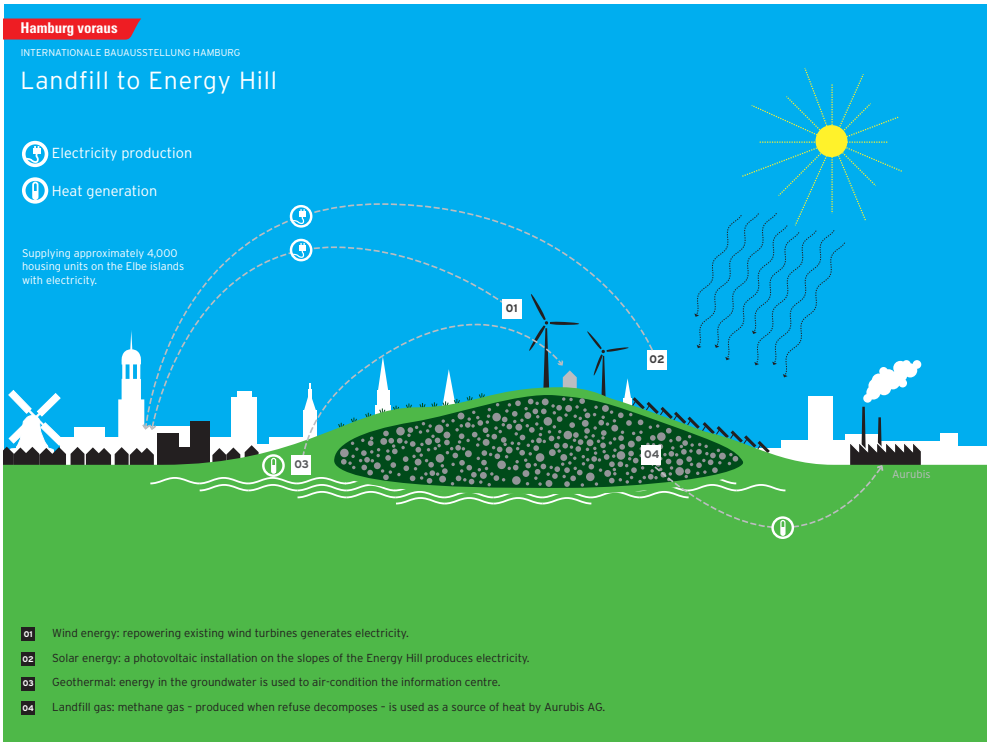


Fig. 28: Infographics on energy generation at the Energy Hill

The "Energy Hill" reflects one of the core ideas behind the IBA's "Renewable Wilhelmsburg" Climate Protection Concept in its very name: local production of renewable forms of energy on the Elbe Islands.
In addition to the two forms of energy generation that had been used previously – wind power and landfill gas – the "Georgswerder Energy Hill" project offered the opportunity to harness solar energy and heat recovery. Repowering allowed the wind to be exploited more effectively.
The "Georgswerder Energy Hill" is thus set to generate electricity for about 4,000 households. This corresponds to 20% of all housing on the Elbe Islands.

B.5.1 Wind Power

The first wind turbine, model AN Bonus (power rating 150 kW) was erected on the top of the landfill mound as early as 1992. Two more turbines, this time model Tacke TW 500 (each 500 kW), followed in 1994 and 1996. The three turbines generated a total annual output of 1.4 million kilowatt-hours. In 2004 the REpower MD 77 turbine (power rating 1,500 kW), which is still standing, was added at the bottom of the southeastern side of the mound, with an annual output of 3.6 million kilowatt-hours. It remains the property of REpower and Senvion.

Repowering

The three turbines on top of the landfill mound were repowered by HAMBURG ENERGIE in 2011 as part of the IBA project – in other words, they were replaced by a more efficient model (REpower 3.4M104). This turbine turns more slowly, creates fewer disruptive shadows and noises, and generates more than four times as much electricity as the old turbines put together.

Foundations

Laying the foundations for the new wind turbine on the "Energy Hill" represented a huge challenge for everyone involved. It was not possible to sink pillar foundations for any of the wind turbines on the "Energy Hill" site; instead, they float on flat foundations. Before the 2011 turbine could be erected, it was necessary to open the landfill's sealing sheet and construct 5 metre deep foundations with a diameter of 23 metres and a weight of 1,000 tonnes. The interlayers were filled with foam glass gravel in order to keep the weight the same as the previous turbines. This was aimed at minimising the danger of subsidence. After the construction of the foundations the actual installation of the new wind turbine took only a few days. With a power rating of 3,400 kW, the turbine generates 8 million kilowatt-hours per year. It is owned by HAMBURG ENERGIE.

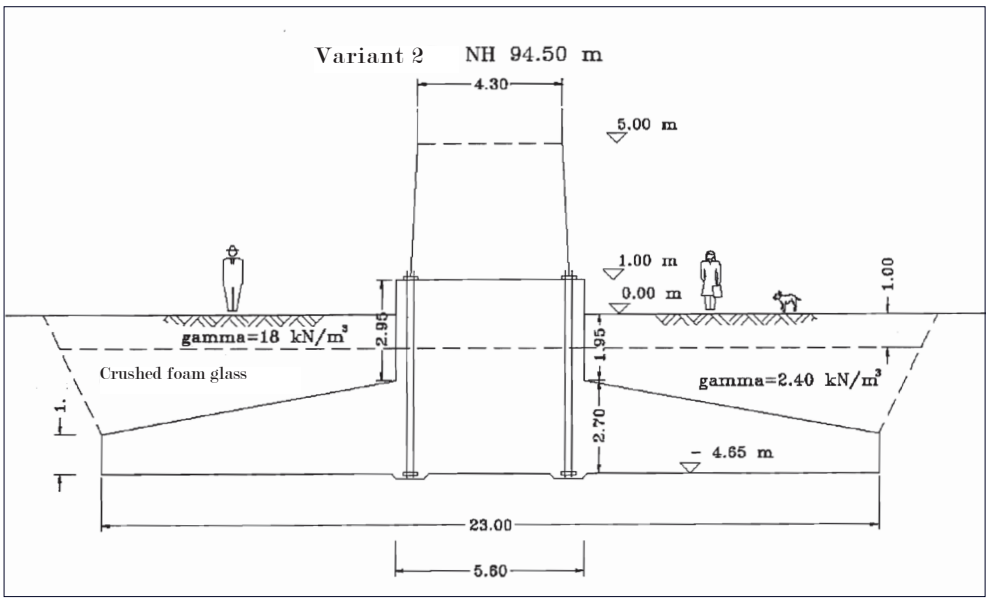
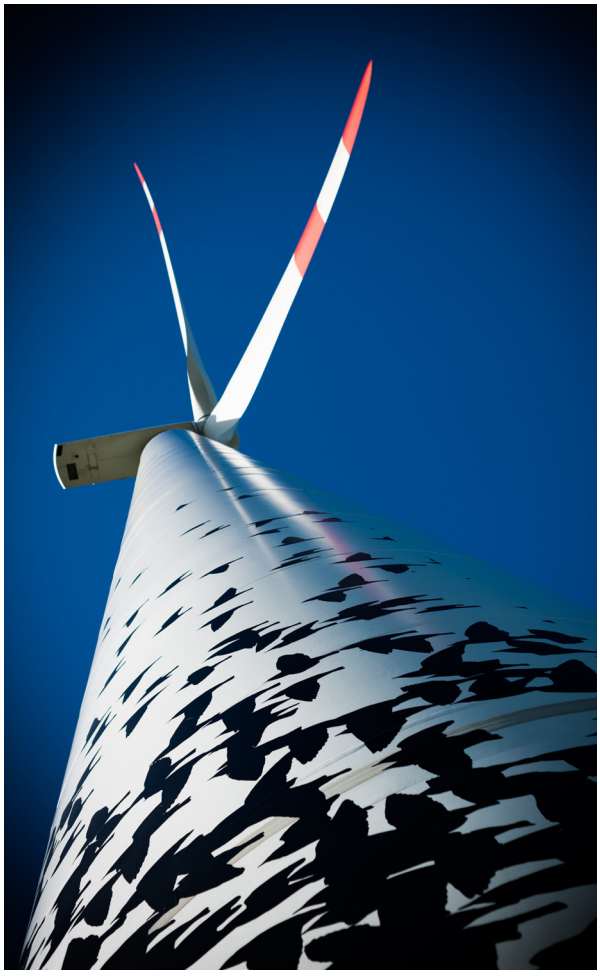


Fig. 29: Cross-section of the foundations of the new wind turbine

Fig. 30: The foundations are filled with crushed glass, 2011

Fig. 31: Erection of the wind turbine mast, 2011

Fig. 32: Pre-assembly of the wind turbine, 2011



Figs. 33, 34: Foot of the mast, 2012, and with artistic design, 2013

Mast Base Design

The bottom 15 metres of the turbine's mast was designed as part of the art competition run in 2013 by HAMBURG ENERGIE and the IBA Hamburg. The artistic design is intended to emphasise the symbolic nature of the "Georgswerder Energy Hill" as a Hamburg landmark. At the same time, it prevents small birds with poor eyesight from colliding with the mast. The winning design is by the Hamburg-based artist Jan Köchermann.

B.5.2 Photovoltaics

Fig. 35: South-facing slope with photovoltaic unit, 2012

The unshaded south-facing slope of the site offers enough room for a large photovoltaic installation.

The first phase of construction, with approximately 500 kilowatts-peak power, was carried out in 2009 by HAMBURG ENERGIE; the second followed in December 2011 with approximately 200 kilowatts-peak. The unit constructed in 2009 was the first generator facility to be built by HAMBURG ENERGIE.
The unit covers approximately 7,000 square metres and on completion was the largest free-standing photovoltaic unit in Hamburg.
As with the wind turbines, the specific soil conditions had to be taken into account during construction. The foundations were laid in such a way that they could also withstand high wind loads.
The annual yield is 0.56 million kilowatt-hours. This is roughly equivalent to the electricity consumption of 186 households.

Fig. 36: Foundations of the photovoltaic unit

B.5.3 Landfill Gas

Fig. 37: Gas duct before made safe, 2010

Continuous decomposition processes within the mound create landfill gas with a high methane content, about 140 cubic metres of gas per hour (2010). This is equivalent to a heat output of 800 kilowatts. About 4,000 kilograms of matter thus leak from the landfill every day.

There are no highly toxic dioxins within the landfill gas, but there are a number of reasons for absorbing the gas instead of letting it escape into the atmosphere.

A degassing unit was put into operation back in the early 1980s for this purpose. The principal reason for its construction was the need to keep the outer surface of the former landfill free of gas, in order to prevent damage to the vegetation and reduce the risk of explosions and fires.

It subsequently became clear that degassing should be carried out because of global climate change. The landfill gas could be used to save natural gas in the neighbouring Aurubis AG copper smelter, while also preventing the strongly climate-altering methane from seeping into the environment.

In 2010 approximately 4,700 megawatt-hours of energy were delivered to Aurubis and converted into electricity equivalent to around 1,500 megawatt-hours.

Dependent on the natural biological degradation processes in the landfill, the amount of gas is decreasing over the long term. In 1996 approximately 0.8 million cubic metres of methane were delivered, but by 2010 this had dropped to around 0.42 million cubic metres. Research indicates that the gas production of landfills halves every six to eight years, while the figure for the Georgswerder site is estimated at around 10 years. It is expected that over an even longer timeframe the landfill gas will accumulate to a level at which it can be used.

B.5.4 Heat Recovery

The seepage water from the landfill is captured along with the groundwater, purified under controlled conditions and drained. The energy content of the groundwater is harnessed with the use of a heat pump, in order to produce room heating for the new operations and exhibition building. The required operating energy is generated on-site by the photovoltaic unit on the south-facing roof areas of the adjoining space and the neighbouring building.

Fig. 38: Technical room within the informationcentre, 2011

B.5.5 Biomass

The use of biomass on the "Georgswerder Energy Hill" is a project for the future. The twice-yearly mowing of the site could be used to produce bioenergy.

Fig. 39: Mown grass on the Energy Hill, 2012

B.6 EnEff:Stadt Monitoring

In order to assess the projects of the IBA Hamburg after their completion, a monitoring research project is being carried out over 48 months by the State Ministry for the Economy and Transport, overseen by the Technical University of Braunschweig.
Energy production and consumption across the whole IBA area and individual IBA projects are to be monitored, analysed and documented using a holistic approach. Data for energy production and the buildings of the "Georgswerder Energy Hill" will also be evaluated.
The aim is an integratedmethod, in which data from different sources are brought together in a monitoring project, and made available in a range of formats and media, including the "energy table" in the IBA DOCK or on individual monitors at the "Energy Hill" and in the "Energy Bunker".

Specific construction and energy-related measures are being collated metrologically and documented, at different levels of detail. The annual electricity and heat consumption of a number of buildings are recorded and processed in a simplified monitoring project. In addition, there is an in-depth assessment of ten selected innovative and forward-looking projects and the heat grid. For these, up-to-date electricity and heat production and consumption data are collated and analysed, at the very least. The influence of user behaviour on energy consumption will also be analysed using surveys for particular projects.

Fig. 40: The energy table with the results of the monitoring project at the IBA DOCK

RESEARCH PARTNERS

Funding: State Ministry for the Economy and Technology
Proposer: IBA Hamburg GmbH
Project management and coordination, simulation, monitoring and evaluation: Technical University of Braunschweig, Institute for Building and Solar Technology, Prof. Dr.-Ing. M. N. Fisch
Evaluation of user behaviour and user satisfaction: HafenCity University Hamburg, Prof. Irene Peters, REAP research group, Prof. Dr. Ingrid Breckner, Urban and Regional Sociology
Equipment concept and simulation: Ostfalia Hochschule für angewandte Wissenschaften

C Visitor facilities

C.1 Visitors

Fig. 41: The information centre during the Long Night of Museums, 2013

Due to the sequence of construction measures the hill opened to visitors in stages. The site was made increasingly attractive, and this was reflected in the visitor numbers.
The hill first offered a tour programme and a temporary exhibition in the information centre from August to October 2011.
The permanent exhibition in the cinformation entre began in June 2012. This was accompanied by tours of the "Energy Hill", which was not yet open to the public.
In the IBA Presentation Year, 2013, the exhibition and 22 hectares of the "Energy Hill" were made accessible to the public from the end of March until the beginning of November. Almost 60,000 people visited the "Energy Hill" in this period alone.
The "Georgswerder Energy Hill" is not a conventional park, but still a landfill site. Visitors are permitted into the area only between specific opening times. In 2013 the site was open between 10.00 and 18.00 every day. Every first Saturday of the month the "Energy Hill" is open until 22.00, and until midnight during the summer months. These longer opening hours, until twilight, afford the opportunity to experience the hill, the illuminated Horizon Footpath and the view of the city in a way that is completely different from during the day. These occasions are in great demand.

Visitor development on the Energy Hill

	Visitors	Groups	Visitors in groups	From Hamburg	From rest of Germany	International visitors
2010	1.705	51	893	400 (45%)	286 (32%)	207 (23%)
2011	2.804	182	2349	1623 (69%)	116 (5%)	610 (26%)
2012	4.919	291	3170	2356 (74%)	219 (7%)	595 (19%)
2013	58.635	484	9813	7055 (72%)	1569 (16%)	1189 (12%)

Hill Rules

Given the vulnerability of the site (increased risk of the vegetation catching fire due to lack of groundwater on the mound, rare types of animals and plants, etc), rules of conduct – or hill rules – were established for visitors by the State Ministry for Urban Development and Environment and the Agency for Environmental Protection and Soil Conservation/Hazardous Sites. These rules must be followed by visitors.

1. Please do not leave the permitted areas under any circumstances.
2. Shafts and technical installations should not be entered.
3. Keep clear of the bushes, and do not disturb the animals.
4. Please do not damage the valuable vegetation cover.
5. Smoking and open flames are not permitted.
6. You must leave the hill if there is a thunderstorm.
7. No dogs are allowed on the landfill site.
8. Please follow the instructions of the staff.
9. Visiting the hill is at your own risk. Parents should watch out for their children.
10. Asthmatics: there may be air pollution from the nearby industrial area, which may, with physical exertion, lead to breathing impairment.

Fig. 42: Tour guided by project coordinator Simona Weisleder, 2012

Fig. 43: Tour guided by the director of the information centre, Deik Esser, as part of the IBA tour programme, 2012

Future 2014+

The "Georgswerder Energy Hill" was heavily promoted as part of the IBA Presentation Year, and was one of the most visited individual projects of the building exhibition, after the "Energy Bunker" and the IBA DOCK.

Many Hamburg residents became aware of Wilhelmsburg during the IBA Presentation Year. The "Energy Hill" benefitted greatly from this increased awareness. Initiatives such as the Young Hamburg Climate Conference led schools to consider the site as a place of learning and a leisure destination.

It is now certain that the "Energy Hill" will continue to serve as an exhibition venue for visitors in the future. The City of Hamburg will take over the project, continue to build on the successful visitor programme and add new content. From the beginning of April 2014 the site, including the exhibition and the Horizon Footpath, will be open at regular hours. Tours and guided walks will take place, and there will be plenty of public space for further events and creative ideas. The history of the "Georgswerder Energy Hill" and its transformation from a landfill into a symbol for the way in which old, problematic sites should be handled will continue to be told.

C.2 The Energy Hill as Venue

Fig. 44: On the Horizon Footpath on the Long Night of Museums, 2013

Devising the exhibition at the "Georgswerder Energy Hill" and ensuring that it would serve as a day trip destination and informative venue presented a challenge, as the site is off the beaten tourist track. In addition, as a previous "non-place", the former landfill first had to register in the public's awareness of leisure venues. The site has tourism potential due to its proximity to various bicycle routes and the BallinStadt Emigration Museum. Conversations with visitors have also shown that drivers have seen the Horizon Footpath from the autobahn and have become aware of and curious about the "Energy Hill".

Nonetheless, the hill must make its mark in order to be widely seen as a day trip destination. In addition to the daily opening times, in recent years numerous special events have taken place here. The "Energy Hill" was a venue for established Hamburg events such as the Night of Knowledge and the Long Night of Museums. The night walks on the hill are a particular magnet for the public. The transformation of the "Energy Hill" as part of the IBA Hamburg began back in 2007 with the temporary art installation Twin Peaks.
Since 2010 an annual festival – the Bergfest – has taken place in cooperation with Georgswerder residents.

Fig. 45: Flyer for the Bergfest 2012

Fig. 46: The "tent city" for the Young Hamburg Climate Conference, 2013

The IBA Presentation Year 2013 began with the opening weekend and the light installation Crossing the Elbe by Anthony McCall on the hill. The biggest challenge in the "Energy Hill's" events programme was the Young Hamburg Climate Conference, which took place from 11 ŧ14 June 2013 on the Elbe Islands, under the slogan "Explore – Experiment – Experience". The aim of the event was to make the younger generation aware of climate protection, to motivate them to act independently and to make their voice heard. Following two days of excursions, the last two days of the conference took place in a "tent city" on the "Energy Hill". The results were recorded in workshops and concrete proposals for more renewable energy, better recycling and healthy eating, to be implemented as policy were presented at the end of the conference.

Fig. 47: Presentation of proposals by young people to Senator Blankau at the Young Hamburg Climate Conference

Fig. 48: Twin Peaks, 2007

Abb. 49: Boardercross, 2010

Fig. 50: Yoga on the Energy Hill, 2013

A total of almost 700 children and young people attended the event. One group of pupils even travelled to the conference from Boston, USA.

The "Energy Hill" is an appealing events venue despite its constraints and the need for coordination due to its location and its nature as a working landfill: problems include the risk of lightning, high wind loads on the hill, the ban on fires and smoking, no drinking water on the hill, long distances between electricity supply points and strict requirements for soil-related procedures. Any structures or procedures, including safety measures, must be carefully fine-tuned.

Hamburg had never previously had a hill used as a venue, but the idea chimed with many organisers. For the second time since 2010, in 2013 the site hosted a skateboarding event, Boardercross, organised by rollsport hamburg e.V. The Skyline-Run-Event, organised by the Wilhelmsburg Fire Service and the Hamburg Fire Service sports group, also took place here, and will be repeated in 2014.
Yoga sessions have also been held on "Energy Hill", and tango milonga dancing was a fantastic experience for many visitors as part of the 24 Hours of the IBA event.
One cultural highlight in 2013 was the mobile "Flexibles Flimmern" ("Flexible Flickerings") cinema, which screened the documentary "Müll im Garten Eden" ("Rubbish in the Garden of Eden") by Fathi Akin at the Energy Hill Open Air event. The film's subject matter has strong parallels with the Georgswerder district.

C.3 Seminar and Exhibition Space

Fig. 51: Till Leeser's exhibition, "Waste", 2011

The information centre has an adjoining seminar room. It has been hired out countless times, for example by universities and the State Ministry for Urban Development and Environment (BSU), and has also been used for special exhibitions.

Two of these exhibitions were particularly noteworthy: "Waste" (2011) by the photographer Till Leeser, featuring photographs of rubbish from a new perspective, and the 2013 exhibition "Upcycling" by the Department of Textile Design of Hamburg University of Applied Science, under the direction of Professor Renata Brink. The students demonstrated how waste materials and old clothing can be upgraded and made useable once more.

Fig. 52: The "Upcycling" exhibition, 2013

D Project Partners and Resources

PROJECT PARTNERS

Owner
The Free and Hanseatic City of Hamburg – State Ministry of Urban Development and Environment, Agency for Environmental Protection – Soil Conservation/Hazardous Sites

Approving authorities
The Free and Hanseatic City of Hamburg – State Ministry of Urban Development and the Environment, Agency for Environmental Protection – Waste Management

Energy installations
HAMBURG ENERGIE

Other project partners
Georgswerder Working Group, Hamburg-Mitte District Authority, State Ministry of Urban Development and the Environment / Leap across the Elbe Project Group

Landscape planning
HÄFNER / JIMENEZ, Büro für Landschaftsarchitektur, Berlin

Technical landscape planning

Lighting design	Edgar Schlaefle, Berlin
Electrical engineering	IBB Ingenieurbüro Siebeck, Berlin
Steel construction site planning	Sauerzapfe Architekten, Berlin
Structural planning	ifb frohloff staffa kühl ecker, Berlin
Building site surveying	IGB Ingenieurgesellschaft mbH, Hamburg
Countervailing measures	ELBBERG Stadt - Planung - Gestaltung, Hamburg
Stress analysis	Wetzel & von Seht, Hamburg
Safety concept	melchior+wittpohl Ingenieurgesellschaft, Hamburg

Structural architecture
Konermann Siegmund Architekten, Hamburg

Exhibition planning
mgp ErlebnisRaumDesign, Hamburg, with Markus Beck (direction)

Technical concept, lighting design and programming
Intermediate Engineering, Hamburg

PROJECT DATA

Size:	45 ha, of which 22 ha are accessible to the public (equivalent to the surface of Hamburg's Inner Alster)
Height:	approx. 40 m hub of the wind energy installation: just under 100 m
Total output:	12.2 million kWh per year electricity from wind and solar energy for 4,000 households
Wind turbine:	8 million kWh per year
Photovoltaic unit:	560,000 kWh per year
Landfill gas:	1,500 MWh per year

Timeframe

December 2009	Completion of the first phase of construction for the photovoltaic unit
June 2010	First Bergfest
August 2011	Opening of the information centre
December 2011	Completion of the second phase of construction for the photovoltaic unit
January 2012	Inauguration of the new wind turbine
June 2012	Opening of the multimedia show in the information centre
23 March 2013	Opening of the Horizon Footpath and open access to the Energy Hill

PROJECT RESOURCES

Total investment for the information landscape: € 9.14 million

Landscape:	€ 5.17 million for the Horizon Footpath, including the creation of the path
Building:	€ 1.42 million for the building, including the photovoltaic unit on the roof
Exhibition:	€ 0.95 million
Infrastructure:	€ 1.60 million (outside access, car park, toilet huts, additional building costs, etc.)
Funding:	€ 4.32 million from the European Regional Development Fund (ERDF)

Total investment for the energy installations: € 7.3 million
The investor is HAMBURG ENERGIE

Wind turbine:	€ 4.5 million for the wind energy installation
Photovoltaic unit:	€ 2.8 million for the photovoltaic unit
Funding:	€ 0.44 million from the ERDF for the photovoltaic unit € 80,000 from the City of Hamburg for the photovoltaic unit € 80,000 from the IBA for the photovoltaic unit

E Picture of Georgswerder's Future

E.1 History of Georgswerder

The history of the "Georgswerder Energy Hill" is inextricably bound up with that of the Georgswerder district.
What we know as Georgswerder today is merely the remains of what was once the large Gorrieswerder marsh island. Parts of Gorrieswerder were thought to have been populated as far back as 3,500 years ago, when people built their houses on dwelling mounds. By the 12th century, the residents began to surround the land with dykes. Due to the constant dampness the land was not suitable for arable farming, but ideal for pastoral farming and vegetable growing. Another source of revenue was the sale of river ice from the Dove Elbe to tavernkeepers and butchers. During industrialisation the district had two notable factories – a steam-powered brickyard and a cannery. The brickyard ponds remain to this day as a trace of this period.
Today Georgswerder is part of the Wilhelmsburg district, within the Hamburg-Mitte District Authority. Its physical boundaries are formed by the Dove Elbe to the southwest, the B255 to the north and the A1 autobahn to the east. The road layout adds to this barrier effect, making Georgswerder an island within an island, with only a few access routes.
The lifeline and main route within the district is the Niedergeorgswerder dyke. Individual branch roads extend from it like fingers, providing access to the settlements that lie behind it. The built-up area mostly consists of one- and two-storey housing, while there are also some multi-storey buildings on the dyke. However, there are gaps

Fig. 53: Site plan of the Georgswerder site on the Elbe Island

in the streetscape, and those who drive by can catch repeated glimpses of the natural surroundings.
With approximately 1,700 residents and around 451 hectares, Georgswerder has many nearly natural green spaces. The number of inhabitants increases significantly during the summer months due to people using the numerous garden plots. However, there are very few residents living here permanently.
The storm surge of 1962, which caused 40 deaths in Georgswerder alone, and the toxic waste scandal of the 1980s led many residents to leave Georgswerder. Lack of purchasing power saw the local supply structure shrivel, and today there is insufficient infrastructure to meet the residents' everyday needs.
Most locals use the semi-natural green spaces alongside the Dove Elbe for recreation.
The Sinte settlement is a village within the village, primarily inhabited by the Weiss family. It has existed here since 1982. In recent years many Bulgarians have also moved into the northern part of the district.
The Rahmwerder Strasse Primary School is an important institution for community life within the district. It is vitally important to keep the school in the interests of quality of life, in particular for young families. It was saved from closure through the efforts of Georgswerder citizens. The old school building was also saved, is now listed and has been converted into a workshop for artists. The school and the art house will form the core of a new hub within Georgswerder in the future.

Fig. 54: Niedergeorgswerder dyke at the turn of the nineteenth century

Fig. 55: Niedergeorgswerder dyke, 2013

E.2 Georgswerder Working Group

In December 1983, in the wake of the Georgswerder waste landfill scandal, a group of committed local residents joined the Wilhelmsburg/Neuland Citizens' Initiative. When it became clear that the work to improve Georgswerder would have to be carried out over a long period, a separate Georgswerder Working Group was formed between late 1985 and early 1986.

Whether addressing contaminated sites or incinerator plants on the hill, the closure of allotments and schools, the construction of play parks or the avoidance of asphalt paths in the nature reserve, the list of activities carried out by the Georgswerder Working Group is long and impressive. Many new initiatives for the district are thanks to the Working Group. Besides monitoring the rehabilitated landfill, its aim is to facilitate positive and valuable urban development in Georgswerder and to protect the environment and natural surroundings with maximum participation from the group's own members. It will seek to address other weaknesses within the district in the future. Ideas and suggestions were put forward at the Picture of Georgswerder's Future 2025 event, organised by the IBA Hamburg.

Figs. 56, 57: The old and new logos of the Georgswerder Working Group

E.3 Picture of Georgswerder's Future 2025

Fig. 58: Workshop for the Picture of Georgwerder's Future at Rahmwerder Strasse Primary School, 2011

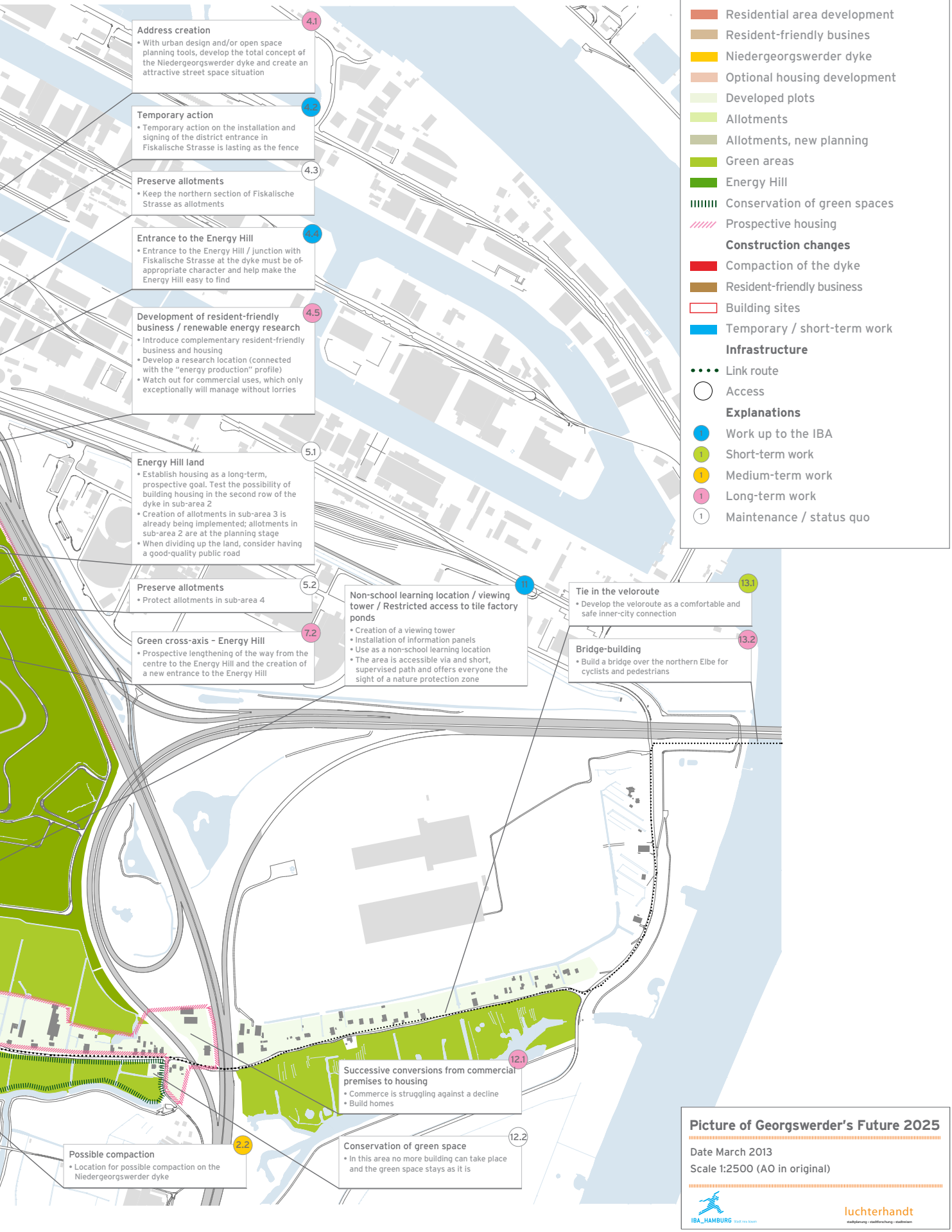
After over 25 years of cleaning up the Georgswerder landfill, it is clear that the "Energy Hill" can breathe positive energy into the district and spark new interest in the site, even after the IBA. The spirit of optimism should be channelled into addressing the pressing needs of the district: roads, paths and many houses on the main street are in a poor condition, people from different cultures could coexist better as a community, and there is a lack of local amenities and infrastructure.

On the suggestion of the Georgswerder Working Group, a district workshop was held to devise solutions and measures for existing problems. In 2012 four planning teams got together with the residents to brainstorm and work out which core themes seemed most pressing. The task was then to condense their ideas for future changes within the district into a coherent picture for the future. This was to take the form of a "viable vision", with clearly specified goals and quality standards as a framework, and the power to demonstrate to all citizens, policy makers and city administrators that it represented a mutually agreeable goal that should be pursued as a vision for the district using a tried and tested cooperative partnership. An advisory body discussed the proposals of the planning teams and the comments of the local residents, and came up with recommendations for further consideration.

Georgswerder citizens were once again asked for their views during the final and approval stages of the Picture of Georgwerder's Future. The planning recommendations of the advisory body were further developed in three workshops, while the Picture and its priorities were honed. Four district residents presented the Picture to the locals and those from neighbouring areas on 31 October 2012.

Picture of Georgswerder's Future 2025

Fig. 59: Picture of Georgwerder's Future


Address creation
• With urban design and/or open space planning tools, develop the total concept of the Niedergeorgswerder dyke and create an attractive street space situation
4.1
Temporary action
• Temporary action on the installation and signing of the district entrance in Fiskalische Strasse is lasting as the fence
4.2
Preserve allotments
• Keep the northern section of Fiskalische Strasse as allotments
4.3
Entrance to the Energy Hill
• Entrance to the Energy Hill / junction with Fiskalische Strasse at the dyke must be of appropriate character and help make the Energy Hill easy to find
4.4
Development of resident-friendly business / renewable energy research
• Introduce complementary resident-friendly business and housing
• Develop a research location (connected with the "energy production" profile)
• Watch out for commercial uses, which only exceptionally will manage without lorries
4.5
Energy Hill land
• Establish housing as a long-term, prospective goal. Test the possibility of building housing in the second row of the dyke in sub-area 2
• Creation of allotments in sub-area 3 is already being implemented; allotments in sub-area 2 are at the planning stage
• When dividing up the land, consider having a good-quality public road
5.1
Preserve allotments
• Protect allotments in sub-area 4
5.2
Green cross-axis – Energy Hill
• Prospective lengthening of the way from the centre to the Energy Hill and the creation of a new entrance to the Energy Hill
7.2
Non-school learning location / viewing tower / Restricted access to tile factory ponds
• Creation of a viewing tower
• Installation of information panels
• Use as a non-school learning location
• The area is accessible via and short, supervised path and offers everyone the sight of a nature protection zone
11
Tie in the veloroute
• Develop the veloroute as a comfortable and safe inner-city connection
13.1
Bridge-building
• Build a bridge over the northern Elbe for cyclists and pedestrians
13.2
Successive conversions from commercial premises to housing
• Commerce is struggling against a decline
• Build homes
12.1
Conservation of green space
• In this area no more building can take place and the green space stays as it is
12.2
Possible compaction
• Location for possible compaction on the Niedergeorgswerder dyke
2.2
Key
Uses
Residential area development
Resident-friendly busines
Niedergeorgswerder dyke
Optional housing development
Developed plots
Allotments
Allotments, new planning
Green areas
Energy Hill
Conservation of green spaces
Prospective housing
Construction changes
Compaction of the dyke
Resident-friendly business
Building sites
Temporary / short-term work
Infrastructure
Link route
Access
Explanations
1 Work up to the IBA
1 Short-term work
1 Medium-term work
1 Long-term work
1 Maintenance / status quo
Picture of Georgswerder's Future 2025
Date March 2013
Scale 1:2500 (AO in original)
IBA_HAMBURG
luchterhandt

The proposals were categorised into short-, medium- and long-term ideas for upgrading the district.
Some short-term measures, such as the restructuring of the bridge at the entrance to the district (Georgsbrücke) and the temporary makeover of the construction hoarding on Fiskalische Strasse, at the entrance to the "Energy Hill", with a fence banner (the "Georgszaun", or "Georg's fence") featuring portraits of local residents were implemented in 2013.
The implementation of further measures and discussions with residents are set to continue in order to offer the district long-term prospects.

Fig. 60: Georgsbrücke ("Georg's bridge"), 2013


Fig. 61: Georgszaun ("Georg's fence"), 2013

F Summary

The landfill has been transformed into the "Georgswerder Energy Hill"! This "non-place" has succeeded in becoming a place to be reckoned with. Almost 80,000 visitors have ascended the hill in the last few years to enjoy new views over Wilhelmsburg and Hamburg.
This transformation was possible only because all of those involved worked hard together with a firm objective in mind. On the one hand, there was the running of the landfill to consider – first and foremost, it was necessary to ensure the ongoing safety of the technical installations and to secure the hazardous parts of the site. On the other hand, it was vital to provide information about the important work that is carried out here.
In the future the hill will continue to be open to interested visitors. It has been possible to find a great compromise between the openly accessible areas and those that require sensitive security technology, as well as those that cannot be accessed in order to protect the flora and fauna. With 22 of its 45 hectares now accessible, the hill has been integrated into the urban context for the first time.

The unusual, sensitive yet imposing landscape design by the Berlin-based firm HÄFNER / JIMENEZ has also made a major contribution to the success of the project. The firm also had to walk the tightrope of adhering to specific safety conditions, complying with particular requirements for the landfill and yet implementing an impressive, almost poetic walkable sculpture that appeals to the senses – the Horizon Footpath.
The new information centre by Konermann Siegmund Architekten, from Hamburg, with a highly successful multimedia show and the exhibition by mgp ErlebnisRaumDesign GmbH, also from Hamburg, provide the perfect addition to this informative site.
The theme of energy already had a long tradition on the hill, with the existing wind turbines, installed by the BSU, but thanks to the involvement of the IBA Hamburg and their collaboration with HAMBURG ENERGIE the site could really become an "Energy Hill" for the first time. In addition to generating renewable energy for 4,000 households, visitors have the novel experience of getting really close to large-scale energy production units. People can walk almost right up to the big new wind turbine, thus promoting acceptance for such technology.

The Georgswerder landfill was the site of the largest environmental scandal in Germany in the 1980s, and this had a significant impact on development within the district. Many people moved away, and the stigma hangs over Georgswerder to this day. However, it also brought the people who live here closer together, and made them into highly committed, spirited, responsible and outspoken citizens who work tirelessly for their district. These people recognised the opportunity offered by the IBA Hamburg and its "Georgswerder Energy Hill" project, and added their voices to ideas for the design. In particular, they have contributed to plans for the next step, and helped to develop the Picture of Georgswerder's Future 2025 together with experts in a dedicated process. This now serves as the foundation for the development of the district after the IBA. The positive renewable energy from the hill has also led to a new sense of drive within the district, which will continue to have an impact.

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