



Hamburg, Wilhelmsburg

Implementation Plan

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Abbreviation

BSU	Behörde für Stadtentwicklung und Umwelt/Ministry for Urban Development and Environment
IBA	Internationale Bauausstellung/International Building Show
igs	International Gartenschau/International Garden Show
RES	Renewable energy sources



Executive Summary

The EU has set ambitious targets until 2020: 20% lower carbon emissions, 20% renewable energy and 20% increase in energy efficiency. Cities play an important role in realising these EU climate goals. The EU project “Transform – Transformation Agenda for low carbon cities” provides insights into smart city processes and methods for cities how to arrive at smart energy plans and projects. Transform provides an integrative approach to a smart city development by using a circular way of thinking.

The work is divided into six work packages, each of these should have a deliverable such as a Transformation Agenda or a Smart City Handbook, at the end of the process. The total outcome of Transform will be used for giving recommendations for the EU Smart City Agenda 2015+.

The implementation plan is part of work package four and is drafted for each Smart Urban Lab (SUL). It shows comprehensively what each city has done and will do to develop smart urban areas in regards to among others stakeholder and investor involvement, linking local development to the city wide strategies and increasing renewable energy. Each SUL is unique thus the implementation plans will differ in their characteristics.

In 2006 the Free and Hanseatic City of Hamburg decided to host the IBA to boost the “Leap across the Elbe” process, which should create new impulses for the Elbe islands Wilhelmsburg and Veddel along with the Hamburg upriver port. The IBA is city owned and was given a budget of 90 Mio. Euros. IBAs are a kind of task force with an exact time limit, namely the presentation year in 2013, and it is structurally separated from “normal” administrative units.

The overall objective for the Elbe island is to become almost 100% renewable until 2050. The aim is to provide exemplary urban responses to the challenges of climate change and to set new standards for the “Metropolis of the future”. In this context it was worked on strategies and projects with the aim to protect the climate focusing on a reduction of green house gasses, energy efficiency and savings as well as promoting renewable energy sources on the one hand (mitigation). On the other hand it was about managing the consequences deriving from climate change (adaptation). All in all every IBA project had to meet the “Climate Protection Concept Renewable



Wilhelmsburg” target, which means that their CO₂ balance should not add to the total emissions on the island.

For the first step to become CO₂ neutral several different RE projects in the IBA area were realised from 2007 to 2013:

- ★ An example for a decentralized district heating grid is the Energy Bunker, a former military bunker of the Second World War. A buffer storage tank holding 2,000 m³ of water was installed in the bunker to take up heat from solar thermal units, waste industrial heat, a wood-chip fired boiler and a biomethane CHP plant. When completed, the energy bunker will supply heating to about 3,000 households and electricity to 1,100 homes.
- ★ The “Energieverbund Wilhelmsburg Mitte” (Integrated Energy Network Wilhelmsburg Central) consists of a number of interconnected power generation plants located in various buildings that form a large “virtual” power station. All nearby residents can feed renewable thermal energy into this thermal grid. A bio-methane-powered CHP plant provides the bulk of the heat supply and also ensures a basic level of service. Solar heat plants located on suitable roofs and facades for example also feed in energy from renewable sources.
- ★ Another iconic technical installation is the Energy Hill. A former toxic landfill was secured, opened to the public and transferred into a place for the production of renewable power. At present a 3.4 MW wind turbine has been installed on the landfill and this, together with another wind turbine and a photovoltaic array covering 1 hectare, generates enough electricity to supply 4,000 households (20% of all households on the Elbe islands).
- ★ Several more buildings, especially the “Smart Material Houses” in the show case houses area of the “Building Exhibition within the Building Exhibition” use their facades and roofs to produce their own heat and electricity.
- ★ Biggest retrofitting project is the “Global Neighborhood” (“Weltquartier”) next to the “Energy Bunker” with the energetic refurbishment or demolition and Passive House Standard new construction of 650 residential units.

The status quo for the energy system for 2013 has been assessed by the new work report for the ENERGY ATLAS, which will be published at the beginning of 2015. The conducted monitoring in the context of the research project “EnEff: Stadt” has come to



the results that on balance 35% of households are supplied with locally produced renewable power and about 14% by renewable heat.

After the realization of the International Building Exhibition in 2013, a follow-up organization is using the existing competence and network to develop and market several new development areas within the borders of the exhibition area as well as areas outside the former area ("Elbmosaik"/"Vogelkamp Neugraben", former barrack area "Röttiger-Kaserne"/"Fischbeker Heidbrook"). In the old exhibition area, the new IBA Hamburg Company is currently in charge to develop three areas ("Georgswerder", "Dratelnstraße" and "Georg-Wilhelm Heights") and to continue the analysis of two more potential development areas and their costs and returns ("North South Axis and "Haulander Weg").

In the frame of the development and marketing of the several areas, the aims of the Climate Protection Concept Renewable Wilhelmsburg and the activities of the Transform Implementation Plan will be considered. Several instruments will be used to ensure the continuation of the work: development of new district heating grids by binding conditions and tender procedures for concessions, concept tender procedures for city owned properties, architecture and project competitions with high standards.



1. Background and context information on the SUL and Hamburg

The following chapter provides some general information about Hamburg and the political frame work as well as the IBA Hamburg.

1.1 Free and Hanseatic City of Hamburg – general information

The City of Hamburg, situated in northern Germany, is a city-state and the second biggest city in Germany. It is one of the few cities in Germany, which have a growing population. According to demographic statistics the population of 1.8 Mio (2014) is growing by 80.000 until 2020. Thus, residential property is very limited especially affordable housing. (Freie und Hansestadt Hamburg – Behörde für Stadtentwicklung und Umwelt, 2007) The economic region “Hamburg Metropolitan Region”, which includes parts of Lower Saxony, Schleswig-Holstein and Mecklenburg-Vorpommern, has a population of about 5 million people.

The city area covers approximately 755 km², large parts of which are made up of green spaces, waters and woodlands: More than 16% of the city area consists of vegetation, parks and recreation areas including agriculturally used landscapes on the outskirts of Hamburg. This might be seen as one of the reasons for Hamburg’s high quality of living and housing. Water covers a further 8% with streams, ponds and lakes such as the inner and outer “Alster”.

Hamburg is a well-known trading centre, this being rooted in its strategic location on the river Elbe between the North Sea and the Baltic Sea. The city is home of the third largest port in Europe and with respect to container traffic it is in the top twenty worldwide. About 74 km² of the city area are port spaces. But as well as being the core of the industrial port the river Elbe also defines natural segments of the city. Industrial sectors in Hamburg include civil aviation, food processing and steel- and metalworking heavy industry.

In order to, on the one hand meet national goals in regards to climate protection and on the other to increase life quality in Hamburg, the Senate has agreed on a climate action plan for the time frame 2007 to 2012, which lists nearly 500 different projects that have been planned, started or realized during this period. Moreover, it was monitored and

updated annually. Besides the individual projects, the State own subsidy programs for energy efficient new buildings, retrofitting the existing building stock and the integration of renewable energies were major contributions for the implementation of climate protection measures. The overall aims were to reduce CO₂ by 40% until 2020 and by 80% until 2050. 15% of CO₂ emissions per capita have been reduced compared to 1990. (Bürgerschaft der Freien und Hansestadt Hamburg, 2013)

In 2013 the climate action plan was pursued by the “masterplan climate protection”, which is complemented by the action plan “adaptation to climate change”. The masterplan maps several measurements in regards to among others mobility, buildings, energy efficiency and renewable energy providing a holistic approach to reach the targets. The timeframe for this masterplan is until 2050, but 2020 is the first milestone. It is expected to have an annual reduction of CO₂ of 2 Mio. tons starting from 2020. Most importantly, it states that the efforts taken by the IBA Hamburg should be pursued, which means that projects that have not been finished yet and new projects should be developed.

1.2 Location of the IBA – Wilhelmsburg, Veddel, Harburg upriver port

The IBA takes place in the two districts Wilhelmsburg and Veddel and in the area of the Harburg upriver port. The area is the largest inhabited river island in Europe with a surface of 35 km² and a population of 55.000. The island is surrounded by the Elbe River, which separates it from the city centre in the north. The urban landscape of the island is very much shaped by the harbour area to the west and industrial areas to the north. Additionally, major traffic lines like the main railroad going from north to south, one of the two major motorways and a main road are dividing the island sharply. The area is connected to the rest of the city by a local train line (S-Bahn) and busses as well as a new cycle route through the harbour and the old Elbe tunnel (International Bauausstellung IBA Hamburg GmbH, 2010).

Furthermore, the area is characterized by 15 different neighbourhoods, which originate from different times. The variety of building and landscape typologies goes from rural areas with agriculture and detached houses to 1970s high-rise residential areas to commercial areas, from allotment gardens to storage spaces for containers. (International Bauausstellung IBA Hamburg GmbH, 2010)

In spite of its centrality and being the geographically largest district of Hamburg, Wilhelmsburg for a long period had been out of sight for the city council and the other inhabitants of the city of Hamburg. For many years the two districts Wilhelmsburg and Veddel have been formed by small businesses, industries and working class housing. The location of the two districts right next to the harbour and cheap housing attracted many working class people and later on migrants with little education. The conversion of port operations to container and increasing automatisation demanded a significant increase in space on the one hand and on the other fewer work forces, which supported the deprivation of the area. In addition, after the great flood in 1962 it was even more neglected by the city of Hamburg, especially as a location for housing. The area mainly served for industry and harbour development. The image of the district was determined by social housing, a waste disposal site (Mülldeponie Georgswerder), container storage and motorways. (Freie und Hansestadt Hamburg – Behörde für Stadtentwicklung und Umwelt, 2013)

Aforementioned Wilhelmsburg has been a rather deprived district in Hamburg so that in 2002 local residence became proactive and hosted a future conference. They created a future vision for Wilhelmsburg, which was written in a so called “White paper” (Weißbuch). It was demanded to improve the schools and public transport, to build new high quality and family friendly new residential areas. (Zukunftskonferenz Wilhelmsburg, 2002)

As a result, in 2003 the development concept “Leap across the Elbe” was planned by the Ministry of Urban Development and Environment (Behörde für Stadtentwicklung und Umwelt, BSU) as a response to the overwhelming demand for new housing space and the idea that the city should rather grow in the middle than on the northern outskirts.

1.3 Structure of population and businesses in the SUL

Although a variety of different measurements have been implemented in the past years, Wilhelmsburg is still a socially deprived district compared to other districts in Hamburg with many households, who rely on social benefits, people with a migrant background and people with no school graduation. The income level is still 25% below

the average in Hamburg. However, the development is positive since 2006. (Freie und Hansestadt Hamburg – Behörde für Stadtentwicklung und Umwelt, 2013)

The 30% share of social housing in Wilhelmsburg is compared to Hamburg (11%) relatively high. However, until 2017 the commitment period for these apartments will terminate and thus the share of social housing is likely to decrease. On the other side a few social housing retrofitting projects will be finished so that it is very likely that the share is not going to decrease as much. Moreover, the average rent has increased by 0.60 Euros to up to 7.99 Euros/m² (2012), which is compared to the average in Hamburg still 3 Euros/m² less. (Analyse & Konzepte – Beratungsgesellschaft für Wohnen, Immobilien und Stadtentwicklung mbH, 2012)

The local economy in Wilhelmsburg is shaped by small business, industries, retail and a hospital, which are related to harbour activities and services such as container storage, logistic, which will still be there in the future. Moreover, Wilhelmsburg is a location for a close connection between living and working, which will be further developed in the future. There are several commercial parks across the district, a new developing creative industry and different other industries. The newly developed Wilhelmsburg central hosts a medical centre, a nursing home and other services and retail.

The number of pupils, who live on the island and finish school with their A-Levels (Abitur) has increased from 23% (2008/2009) to 29% (2012). The Hamburg average is 54% (2011). The percentage of pupils, who leave school without a certificate has decreased at the same time to 15% (2012) compared to 25% in 2008/2009. This is still significantly higher than the Hamburg average of 7%. The unemployment rate has also decreased and is the same as in the rest of Hamburg (11%). (Analyse & Konzepte – Beratungsgesellschaft für Wohnen, Immobilien und Stadtentwicklung mbH, 2012)

Table 1: Basic data for the SUL

	Status quo (year)	Projection (year)
Total area	35 m ²	35 km ²
... of which built up area	1,193 ha (2007) (Internationale Bauausstellung IBA Hamburg GmbH, 2010, p. 48)	
Nr of population	55,000	69,160 (2050)
Nr of households	26,972 (2010)	~34.000 (2050)

2. The International Building Exhibition (IBA) Hamburg 2013

International building exhibitions have a long tradition in Germany. It started in 1901 in Darmstadt (Mathilden Heights) and its aims were to present the latest achievements in building technology to a wide international audience in the framework of world exhibitions. IBAs provided a highly regarded platform for architecture and living culture. Building exhibitions can be viewed as laboratories and motors driving urban development. They are always about more than architecture and buildings. IBAs are a kind of task force with an exact time limit. In 2006 the Free and Hanseatic City of Hamburg decided to host the IBA and the International Garden Show (igs) to boost the “Leap across the Elbe” process, which should create new impulses for the Elbe islands Wilhelmsburg and Veddel along with the Harburg upriver port. Therefore, the city of Hamburg founded these two companies in 2006. Both are city owned and inter linked in terms of structure and management. The IBA was given a budget of 100 Mio. Euros at the start, which was reduced to 90 Mio. Euros after the crisis started in 2009. The IBA Hamburg wanted to develop projects for “the future of the metropolis” in a timeframe of seven years (until 2013). This will be further elaborated below. The overall objective for the Elbe island is to become almost 100% renewable until 2050. (International Bauausstellung IBA Hamburg GmbH, 2010)

Table 2: Main stakeholders

Responsible institution	Role/tasks
IBA Hamburg GmbH	Initiator and Coordinator
Hamburg Ministry of Urban Development and the Environment	so far: Financier and relevant Consultant future: main Initiator and Coordinator
Working Group of JHJ Bleicherode and egs Netzwerk Nordhausen	Conducting Experts
Further involved stakeholders	Role/tasks
Administrations of the Districts of Hamburg Central and Hamburg Harburg	Responsible for local responsibilities like Land Use Plans
Hamburg Financial Administration	Owner of city owned land to be sold during the development
Several administrations, coordinated in the KKS	Responsible for several specific areas and sectors
HAMBURG ENERGIE GmbH	Investor of the main energy installations

Further involved stakeholders	Role/tasks
SAGA GWG	City owned housing company
Several Investors	Investors of the single projects
about 150 institutions being the “IBA partnership”	Support of the IBA developments

2.1 Organizational and operational issues of the IBA Hamburg Company

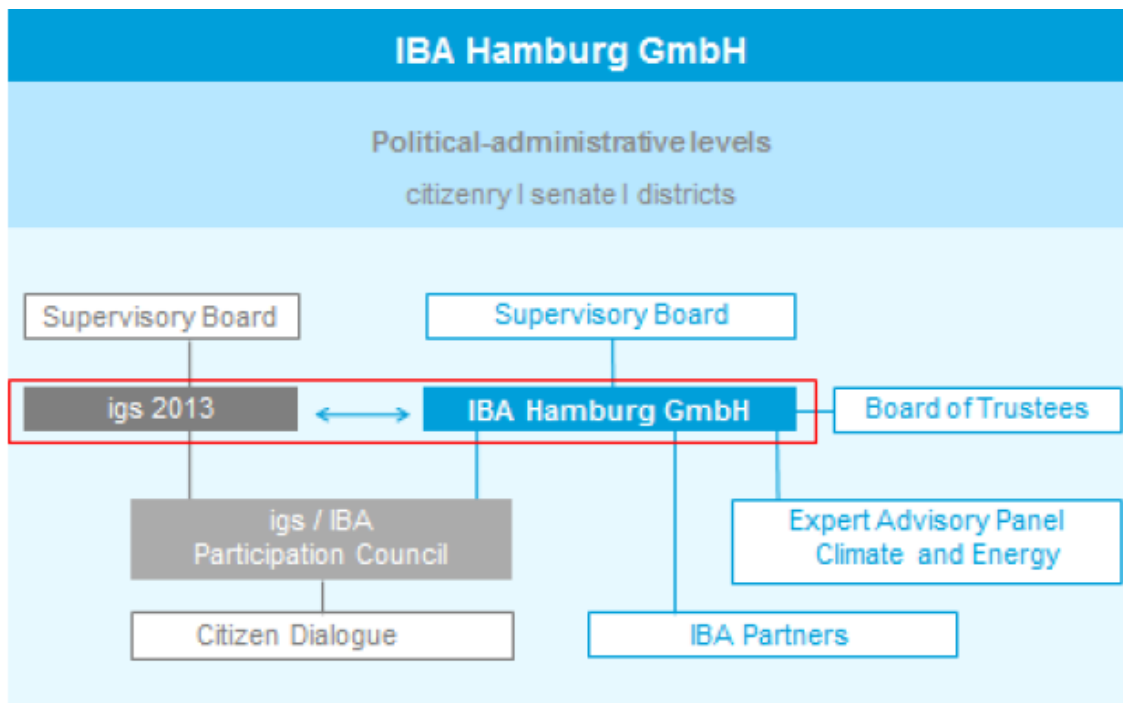
The IBA is a company that is owned by the City of Hamburg and was given its own budget. It is a typical feature of an IBA that it is structurally separated from “normal” administrative units and is usually incorporated as a German GmbH, or limited liability company. It thus has a certain amount of independence from classic administrative hierarchies and can act more like a private enterprise. Although an IBA has no sovereign rights and administrative tasks, it does have a remit defined by the parliament (called Bürgerschaft in Hamburg) and is legitimated by democratic processes. As a consequence the IBA has to work with several official administrations like the BSU, the Ministry of Financial Affairs (owner of the city owned land), the administrations of the districts of Hamburg-Central and Hamburg-Harburg and other responsible administrations and city owned companies. The IBA had two Chief Executive Officers, the CEO from the igs was also the CEO for the IBA and the other way round, to link both companies and events. However, after the presentation year this was reduced to only one. The team of employees of the IBA Hamburg consisted of architects, urban planners, geographers, civil engineers, real-estate agents and employees responsible for the exhibition, public relations, media and publications. During high peaks 40 to 50 people were employed including students and interns. For major events external companies were assigned additionally. Currently, approximately 25 employees are on duty, with the future development and marketing of the post IBA areas, the number of employees will increase again.

Furthermore, several boards, panels and committees consisting among others of experts from universities, companies and institutions, residents and public authorities support the work of the IBA. The board of directors, consisting of several politicians, such as the Senator for Urban Development and the Environment Jutta Blankau, and officials, is controlling the decisions of the IBA and is giving directions. An advisory

panel consisting of international experts has developed the IBA “Excellence criteria” and discussed all relevant concepts. It has no power to make any decisions. Seven excellence criteria, which have to be met by all IBA projects, were developed by a group of experts to assure that IBA projects are not just ordinary but to provide inspiration for new solutions, so to say to set the standards of tomorrow. A project is only acknowledged as an IBA project if it meets all seven criteria. The advisory board on climate and energy consisted of experts from the fields of science, politics and practical application and its task was to accompany the IBA’s work critically and to push for innovation in the IBA projects. Meetings were held three to four times a year.

A special “taskforce” (Projektgruppe “Sprung über die Elbe”) was established within the BSU to support the efforts for the urban development project “Leap across the Elbe”. Additionally a coordination and decision group (Koordinierungskreis “Sprung über die Elbe”) with regular meetings was established in order to coordinate all activities and relevant administrations.

Figure 1: Organisational Structure of the IBA Hamburg GmbH



2.2 Involvement of stakeholders, investors and public

The main task of the IBA is to acquire, coordinate and steer the implementation of private investment or in some cases public funding. The IBA rarely acted as an investor or building sponsor. Each of the projects had to pass through a process of application and approval before being recognised as an IBA project. More commitment to the objectives of the IBA was achieved through the following: Cooperation agreements were signed with all key partners, stakeholders, institutions, private and public companies, which formed the basis for the IBA' collaborative work. The approximately 140 different partners agreed to the following articles of the "IBA partnership":

- ★ To support the aims of the IBA Hamburg
- ★ To develop common Public-Private-Partnership models
- ★ To support the exhibition- and presentation activities of the IBA Hamburg
- ★ Creation of a network for the partners, namely the "Expert Forum", to develop synergy effects, the partners are obliged to work as a multiplier for the future themes and projects of the IBA Hamburg
- ★ As well as to support the planning and participation culture, a common planning culture is an integrated part of the IBA process
- ★ To assure the quality and innovation of the IBA projects

"Quality Assurance Contracts" between the IBA and the single investors were the basis for the purchase agreement of the former city owned properties. In these contracts several aspects were fixed:

- ★ Concept, design and quality of the buildings and projects,
- ★ Energy standard "IBA Minimum Standard" of 30% better than the national regulation (EnEV 2009)
- ★ Participation at monitoring concept
- ★ Consideration of social and educational aspects like internship and training positions
- ★ Consideration of local companies by a special registration concept
- ★ Publication and accessibility during the exhibition
- ★ Grants and penalties
- ★ Deadlines.

The IBA had a budget of 20 Mio. Euros to give out to especially innovative building projects. This additional grant was tied to specific agreements written in the quality assurance contract for each project. Most of the innovative building projects were given an IBA grant. The grant would have been withdrawn if a project did not fulfil the agreement.

Most importantly the IBA Hamburg had the particular standard to secure the support of the local politicians and local residents by involving them in the planning process to a great extent. The citizens on the island were involved in a dozen different ways, depending on the target group and tailored to the individual projects (among others rallies for kids, planning workshops). For all IBA project consultations were held with representatives of the local residents and those directly affected by the measures. The involvement of residents is in particular of high importance when trying to increase the energy efficiency through e.g. retrofitting. Experience showed that people have to be convinced on an emotional level. One way was the “Participation Panel” that consisted of 24 residents, who were advising on the projects but had no power of decision. However, its opinion was seen as vital. Another way was the “IBA Forum/Citizen Chat”, which was regularly held in order to get citizens involved in an open dialogue. In spite of special efforts to get representatives involved immigrants were underrepresented in participation events.

Moreover, so called “IBA laboratories” were hosted with different topics to ensure expert preparation and support on the one side and to debate with citizens on the other. For example, the climate protection concept was critically analyzed by international experts.

Additionally, a great focus was on the publicity of the projects. Numerous project publications with different target groups were published and an IBA newspaper (“IBA Blick”) with current developments, events etc. was published every four months. Furthermore, it was possible to explore the projects on the Elbe island with guided tours on bike or by bus. Each IBA project was equipped with a column that informed about the project. Several small exhibitions for example on the Energy Hill also informed residents and visitors about the development. Additionally, the permanent exhibition “IBA at work” on the IBA Dock was a major contact point for all visitors, expert groups and residents.



Even though the IBA is a city owned company and thus is controlled by the city, it is independent in regards to what project it wants to work with or which concepts it wants to develop. The City of Hamburg does not give any directives about what work the IBA should do.

Moreover, in order to boost renewable energy in the city of Hamburg, the Hamburg parliament founded the municipal utility company called "HAMBURG ENERGIE" in 2009. This represented a significant milestone for the city of Hamburg on its way of becoming the European Green Capital in 2011. HAMBURG ENERGIE became a partner and investor for most of the mayor renewable energy projects in the context of the IBA.

2.3 Key themes

The IBA Hamburg worked with three key themes in order to create the "Metropolis of the Future". To address the conflict between harbour and urban development, the key theme "Metrozones" worked on improving the inner city peripheries together with the city. In this context, "high quality urban districts" were developed and it was attempted to resolve the conflict between working and living areas. In this theme 32 different projects were developed. The key theme "Cosmopolis" deals with the question of how an increasingly multicultural urban society can co-exist in the future. It sees the diversity as a strength, which has to be utilised and facilitated by building new infrastructure and new urban development. The major conceptual terms were "training" and "employment". The theme consisted of 17 different projects. One of the main projects within this theme was the Global Neighbourhood. The former 1930s working class housing estate has been redeveloped, expanded and retrofitted. At the start of the project intensive surveys of the multicultural residents investigating their wishes for how they want to live, in what kind of apartment etc. This was done by "home researchers", students from different disciplines and with diverse language skills. The number of flats decreased following the upgrading and retrofitting of the buildings according to the wishes of the residents. The special success of this project is that even though the flats were upgraded the rent remained at levels similar to those prior. Furthermore, the residents were able to stay in the neighbourhood during the construction work. The existing buildings were retrofitted to meet the New Building energy standard and the new buildings have the Passivhouse standard. The whole



neighbourhood is supplied with energy from the nearby Energy Bunker. (International Bauausstellung IBA Hamburg GmbH, 2010)

The third theme “Cities and Climate Change” arose from the increasing importance that cities, who are responsible for 75% of CO₂ emissions worldwide, advance in the post-fossil age without nuclear power. This urge was particularly highlighted through the publication of the IPCC report in 2007. The aim within this theme is to provide exemplary urban responses to the challenges of climate change and to set new standards for the “Metropolis of the future”. In this context it was worked on strategies and 14 different projects with the aim to protect the climate focusing on a reduction of greenhouse gases, energy efficiency and savings as well as promoting renewable energy sources on the one hand (mitigation). On the other hand it was about managing the consequences deriving from climate change (adaptation). All in all every IBA project has to meet the “Climate Protection Concept Renewable Wilhelmsburg” target, which means that their CO₂ balance should not add to the total emissions on the island. For achieving this, new renewable energy projects will compensate for unavoidable CO₂ emissions. All IBA projects are part of this strategic concept to become 100% renewable on the long term. (International Bauausstellung IBA Hamburg GmbH, 2010)

2.4 IBA Hamburg after 2013

After the realization of the IBA in 2013, a follow-up organization is using the existing competence and network to develop and market several new development areas within the borders of the exhibition area as well as areas outside the former area (“Elbmosaik”/“Vogelkamp Neugraben”, former barrack area “Röttiger-Kaserne”/“Fischbeker Heidbrook”). In the old exhibition area, the new IBA Hamburg Company is currently in charge to develop three areas (“Georgswerder”, “Dratelnstraße” and “Georg-Wilhelm Heights”) and to continue the analysis of two more potential development areas and their costs and returns (“North South Axis and “Haulander Weg”).

The second step to realize the aims of the “Future Concept Renewable Wilhelmsburg” may be seen as an action plan with a time frame from 2014 until 2020 or 2025. The actions to be taken are:

- ★ Continue already started IBA projects



- ★ Start the realization of already planned projects
- ★ Transfer existing IBA structures, concepts and networks into a “post IBA period”
- ★ Develop new projects and
- ★ Attend the general German and Hamburg development.

Within TRANSFORM the climate protection and climate change adaptation model district of Wilhelmsburg should be further developed. The research approaches and results are to be transferred to other neighbourhoods and districts. The results will be further monitored by the project “EnEff:Stadt – IBA Hamburg” until 2016 and are used for the operational optimization of the projects and the analysis of strengths and weaknesses. EnEff:Stadt can be used for the readjustment of the standards and specifications for future projects.



3. Basis for decisions – available data and detailed knowledge

The following part presents several reports and studies, which have generated knowledge for the development of the SUL and which formed the basis for decisions and supported the evaluation of the development process.

3.1 Urban environment types in the climate protection concept renewable Wilhelmsburg

For the climate protection concept renewable Wilhelmsburg urban environment types were used as a basis for determining current and future energy demands in the IBA area. The methodology is based on a spatial energy approach which subdivides the entire district into different zones or urban environment zones. Over 20 different urban environment type categories were identified following a detailed analysis of the information relating to all spaces within the IBA area. The urban environment types were distinguished in regards to their area ground plans, building patterns, density, existing open spaces, compactness, energy demand and their suitability for energy production. These factors have a considerable impact on the actual heat and electricity demand of the buildings. The range of the different types goes from single-family buildings in passive house standard to high-rise estates and pre-industrial districts from before 1840 and many more. The urban environment types form a basis for determining both the current and future energy demand of an area or a whole city. Furthermore, in a second step the efficiency and saving potential of the prototypes were analysed including the determination which kind of energy could be saved. Particularly the heating requirements of the buildings were in focus because a substantial heat reduction can be achieved through retrofitting. Moreover, it was looked at how the buildings could be connected to each other through heating grids in order to be able to use renewable energy in various forms and more efficiently. The third step implied the examination and assessment of different kinds of renewable energy production in the IBA area. The central focus was on mapping the energy capability in regards to surface relevance. This step forms the foundation for a development strategy that eliminates the dependency on fossil fuels, focuses on RE that ideally does not require additional space and makes efficient use of materials. The spatial matching

of the renewable energy potential with the urban environment types is highly important in particular for heating. Close proximity of the heat production to the heat demand minimises losses. Thus, in the analysis of the ENERGY ATLAS either decentralised options for RE heating or RE grids were preferred. (Internationale Bauausstellung IBA Hamburg GmbH, 2010)

Figure 2: Urban Environment Types in the IBA area



3.2 Island – electricity survey

The methodology used in the ENERGY ATLAS was not able to account for the renewable energy sources sufficiently enough because of the high fluctuations. Therefore it was necessary to use another approach to calculate if the Elbe island can indeed be supplied with 100% locally produced renewable energy until 2050. The Island – Electricity survey analysed the optimisation potentials of the electricity production and the electricity demand and also the consequences this has on the electricity grid, storage and load management. The simulation model RESSI (Renewable Energy Simulation and System Integration) was used. The foundation for this model was the development of individual modules according to the urban environment types from the ENERGY ATLAS, considering the amount of electricity produced in these urban environment types, the demand for electricity, the heat demand and heat production. In addition, other renewable energy producers such as the energy bunker and the numerous wind turbines within the study area were integrated in the modeling. The model was supplemented by meteorological data, so that the energy demand and the production for every hour of the year were displayed. Two different variants were modeled, with and without storage for electricity.

The results have shown that a 100% renewable energy supply is only possible on an annual balance, thus no local autarky is possible. The high fluctuations of the renewable energy sources results in high excess electricity during but also to a deficit of electricity. Therefore, to secure the supply an electricity import of 25 MW is necessary. The excess electricity accounts for 158 MW without storage and 132 MW with storage. As a consequence, an optimisation of the load management and storage is necessary. With an optimised load management the electricity demand and supply can be adjusted. Moreover, short-, mid- and longterm storages should be developed and implemented so that the different times of demand and supply can be adjusted. Additionally, the network operator has to deal with a completely new situation because of higher capacities and different directions of the electricity flow. (Peter & Dr. Lutzenberger, 2013)

3.3 EnEff: Stadt IBA Hamburg

The research initiative “EnEff:Stadt – Research for the energy efficient City” has the intention to increase the efficiency via optimised efficient energy supply and use concept. It is funded by the Federal Ministry for Economic Affairs and Energy. The focus of the research initiative is on urban development tasks of the future. Pilot projects will provide examples and findings for a more general application. The research activities and pilot projects are supervised scientifically by a group of research institutions and experienced practitioners. (FIZ Karlsruhe – Leibniz – Institut für Informationsinfrastruktur GmbH)

Several projects of the IBA are being monitored by the Technical University Braunschweig, the HafenCity University and by the Energy Research Centre Lower-Saxony (Niedersachsen) during the time frame from the end of 2011 until the start of 2015. The monitoring is divided into two different groups of projects. In the building monitoring are the IBA Dock, Open House, Gateway to the World, VELUX model home and Water Houses. The Energy Hill, Energy Bunker, deep geothermal and the integrated energy network Wilhelmsburg-Central are part of the grid monitoring. (Institut für Gebäude und Solartechnik, 2012)

As a first step, the energy demand and consumption in the area is scientifically recorded and evaluated. On the basis of anonymized data of individual households, the energy consumption is evaluated. In addition to innovative energy concepts for individual buildings and equipment, various strategies are pursued to enable sustainable innovation. The challenge is in the recording and visualization of the energy data of the individual measures and their transfer to the district. In the future every building could be an energy producer therefore the energy supply and the grids are studied in more detail. (Institut für Gebäude und Solartechnik, 2012)

Results of the researches will be integrated in the discussion about further steps of the implementation.

3.4 ”Hamburg Heat Strategy”

At the end of 2012 a proposal has been made in the Hamburg parliament, which asked for a heat concept for Hamburg. This was done with the background that the share of renewable energy in the heat sector is very minor compared to the electricity sector.

However, in order to meet CO₂ reduction targets the share of the renewable energy has to increase considerably. Especially, because of the high share of heat in the total energy demand. It was demanded to develop a heat concept using the knowledge of an already undertaken study about the energy efficiency of the existing building stock in Hamburg (called “Flächendeckende Erhebung und Kartierung des energetischen Zustands des Hamburger Gebäudebestands”). (Bürgerschaft der Freien und Hansestadt Hamburg, 2013)

3.5 Research by ECOFYS

ECOFYS has created a new building typology for Hamburg, which is based on Hamburg’s Geographical Information System (GIS). A data sheet was produced for every building type, providing individual information on typical characteristics like geometry, total treated floor area, energy demand, energy consumption, used energy mix and estimated state of modernisation. The data base is a sort of decision support tool, when having to determine priority areas for retrofitting, estimating energy and carbon saving potentials. ECOFYS classified 48 different residential and 40 non-residential building types. The already existing GIS for Hamburg was used as a primary tool, data source and sink for the generated information. A building type was appointed to more than 90% of buildings in the Hamburg GIS.

According to the ECOFYS website “The results will serve Hamburg as a major database for adding new data, determining priority areas for energetic renovation, estimating realistic energy and carbon saving potentials, related costs and benefits and strategic decisions on the future heat supply. All new information has been delivered as new part of the Hamburg GIS which is used for urban planning. Alongside having the information in a directly applicable data format, the first useful information on very large non-residential building stock has been provided.” (ECOFYS Germany GmbH) This approach is similar to the spatial approach done in the ENERGY ATLAS, which divided the IBA area into urban environment types. However, ECOFYS focuses on the individual buildings and not on neighbourhoods. Therefore it is more detailed and precise than the approach used by the IBA.

Another survey conducted by ECOFYS is the “Comprehensive survey and mapping of the energetic state of the building stock in Hamburg” (“Flächendeckende Erhebung und

Kartierung des energetischen Zustands des Hamburger Gebäudebestands”). To successfully transform the existing energy system and buildings it is necessary to create a spatial concept, which locates the heating demands and CO₂ emissions in the different districts across the city. The focus is on the assessment of current heating demands in the city and the estimation of future demands. This new knowledge were added to the GIS in Hamburg and form the basis for a future development of a heating concept in Hamburg (see 3.4). The next step would be to develop exemplary heating concepts for different districts. The aim of this survey was to localise different focal points in regards to energy supply and retrofitting options for the building stock in Hamburg. Moreover, the transferability of future district concepts was of importance. (John, Lindner, & Hermelink, 2014)

A third study by ECOFYS focuses on the spatial matching of key performance indicators and maps the relation between on the one side energy consumption and energy supply and on the other side social background and implementation options for specific urban areas. It is expected that a successful transformation is most likely to be achieved through a holistic approach, which means that technical and social data should be joined. According to ECOFYS energy efficiency topics were mainly focused on technical approaches. Local barriers or drivers on a social level were not identified. The knowledge gathered through this survey forms a foundation for the planning and decision making process. It demonstrates how the energy and socio-demographic information can be brought together on a district level. (Lindner & John, 2014)

3.6 Structural monitoring

For generating knowledge about how the IBA Hamburg and other activities affect the social cohesion on the island a so called “structural monitoring” was conducted each year, starting in 2010. This annual empirical analysis looks at indicators such as population, employment, housing and education in order to get a thorough analysis and evaluation also for the mid and long term development on the island.

By comparing the development of indicators on the Elbe islands with the total in Hamburg as well as with the Billstedt district, which is developed with classic urban regeneration tools, the special IBA effects can be identified.



The structural monitoring includes not only the small-scale analysis of statistical data but also extensive interviews with residents and discussions with experts. This allows to include topics that are not covered by existing statistics in the analysis and evaluation.

Data analysis forms the basis for the structural monitoring. The definition of indicators was done in accordance with the “Social Monitoring Integrated urban district development” of the Ministry of Urban Development and Environment (BSU) to allow a comparison. The individual topics cover the different objectives of the IBA Hamburg.

For the most part data was provided by the Statistical Office of Hamburg and Schleswig-Holstein. Other data sources were among others property databases, the small industry database from the Chamber of Commerce or data from the Institute for Educational Monitoring. (Analyse & Konzepte – Beratungsgesellschaft für Wohnen, Immobilien und Stadtentwicklung mbH, 2013)



4. Legal framework, tax incentives, aid schemes

The most important legislation and tax incentives, which set the local and national framework, are sketched in the following part. There are on the one hand national laws regarding the energy standard of buildings and renewable energy sources and on the other hand there are Hamburg specific laws, which are set by the Hamburg parliament and only apply for the City of Hamburg. This will be explained in more detail below. In particular, it has to be mentioned that so far Hamburg is the only municipality in the whole of Germany that has a specific law addressing the energy standard of buildings, which requires a higher standard than the national. However, this additional law was outdated with the updated national law and until now the City of Hamburg has failed at revising its own law.

4.1 German Feed-In-tariff and Renewed EEG system

The renewable energy act (EEG/Erneuerbare Energien Gesetz) law has the following main objectives:

- ★ Sustainable development of the energy supply
- ★ To boost the development of technology for the electricity production with renewable energy sources

The aim is to increase the share of renewable energy sources in the electricity production to 40-45% until 2025 and 55-60% until 2035. This will supposedly be achieved by granting a feed-in tariff for renewable energy producers for a timeframe of 20 years. The feed-in tariff decreases over time depending for which RES. Moreover, through the act priority is given to renewable energy sources in the grid. The EEG determines that the grid operator provides the connection to the RES producers and also the operator is obliged to purchase the RE. This law has been introduced for the first time in 1990 and has been regularly updated to keep up with the latest technology and political development. The last update was July 2014. The national German government decided to reduce the feed-in tariff for new RE producers and to limit the expansion of RES. (Bundesministerium für Wirtschaft und Energie, 2014)

The feed-in tariff for renewable energy sources was relevant for all IBA projects that involved RES.

4.2 Building Regulation EnEV 2009 (Energie Einsparverordnung)

The EnEV is an order by the national government and is based on the law to reduce energy in buildings (Energieeinsparungsgesetz – EnEG). The objective of the order is to reduce the annual primary energy demand in buildings. The initial scope has been expanded through the merging of the heating unit regulations and the thermal insulation regulations. The aim is to reach the energy related goals set by the national government, namely to have a climate neutral building stock until 2050. The order regulates certain standard demands regarding the energy efficiency of buildings, which applies for residential, office and some commercial buildings. It sets maximum values for the annual primary energy demand and the specific transmission heat loss depending on what kind of building it is. The EnEV applies for new buildings and for existing buildings, which are being retrofitted. The order is revised every other year to increase efficiency and to keep updated on current technological developments. (Bundesministerium für Bauen, Stadtentwicklung und Verkehr, 2013) For the IBA projects the EnEV 2009 applied, however the currently valid EnEV is from 2014 with relevant intensification valid from 2016. In the following it is described how the annual primary energy demand is calculated:

Step: 1 Incorporation of installation engineering in the energy balance by taking into account the losses incurred during generation, distribution, storage and handover of the thermal energy. It is no longer the usable energy made available to a space (the useful heat) that is relevant, but the ultimate energy (from the energy source) handed over to the building's site. Step 2: The ultimate energy demand calculated is based on primary energy in that the losses deriving from the generation, conversion and transportation of the respective energy sources are taken into account in a building's energy balance by means of a primary energy factor. (Internationale Bauausstellung IBA Hamburg GmbH, 2010)

4.3 Legal Framework for Urban and Energy Planning

In Germany local district planning is taking place on the basis of the federal building law (BauGB), which consists of regulations that determine the built environment and it defines the most important urban planning tools. It also defines what can be done, who

is responsible and how it can be done. Local planning is done by the municipalities in compliances with the national targets and requirements.

It is not possible to regulate the connection and use of a district heating grid in the local plan. There is no such regulation stated in the federal building law. However, all German federal states have a connection- and use enforcement of district heating grids stated in their municipal codes (Deutsches Institut für Urbanistik, 2011). To justify these regulations, the Hamburg parliament has passed a climate protection law (Hamburgisches Klimaschutzgesetz) in 1997. Until today it is the only federal state in Germany that has a law like this. The aim of the law is to protect the climate through the reduction of the energy demand. To achieve this, it has legally binding requirements for e.g. electrical heating, district heating and the building envelopes. The Hamburg Climate Protection law makes it possible for the Hamburg senate to enact an ordinance that regulates that all new buildings in a specific area have to connect to a district heating grid (§ 4 I HmbKliSchG). The only exemptions in this context are for buildings with a very low energy demand such as passive houses.

The process for implementing a district heating grid goes as follows:

Firstly, an urban design of an area is developed. The data about the density, uses of the area and the foreseen energy standard is used in a heat survey and report, which investigates the heating demand and whether a grid based energy supply would be feasible.

As a next step, based on this survey the municipality can enact a mandatory district heating grid for this area, which means that all buildings have to be connected to it and have to use the district heating.

Furthermore, for the implementation of a grid supplied by local RES, a procurement of the concession for the installation and supply of the heating grid can be done, which means that different contractors or utility companies, who want to run and supply the grid, can apply with their individual concept. A winner is chosen on the basis of the best concept and price. The main criteria for the best concept could be the amount of CO₂ emission per kWh.

In order to achieve that all new buildings in Wilhelmsburg-Central would connect to the local district heating grid the connection was made mandatory through the climate protection law (Hamburger Senat, 1997).

Furthermore, through the climate protection law more tight requirements for the energy demand of buildings than the EnEV were enacted. However, this order refers to the EnEV 2007 and is thus outdated and has not been updated yet. Nevertheless, until now Hamburg has been the only federal state, which enacted such an order (Hamburger Senat, 2007).

4.4 Concept tender offer (Konzeptausschreibung)

The city of Hamburg is applying a particular internal agreement, called “Concept tender offer” when selling municipally owned land to investors or project developers. This will be explained below. Since the beginning of 2010 different authorities responsible for urban planning in Hamburg are applying the method “Concept tender offer”, which was agreed on in a housing development plan to support more energy efficiency and affordable housing especially social housing, successfully. Since then for the allocation of property the quality of a concept is assessed with 70% and the offered price with 30%.

At the start the weighting of the evaluation criteria for the concept quality were evenly distributed: one third for housing and social criteria, one third for urban design and one third for energetic criteria. This has now shifted more towards the housing and social policy criteria. Currently, the housing and social aspects as well as architecture and urban design are rated with 40% each (280 of total 700 pts.) and the energy standard with 20% (140 pts.). In the overall evaluation of price and concept of a bid, the sustainability and energetic criteria only account for 14%.

The energetic criteria are usually evaluated as follows:

KfW Efficiency House 70	20 points
KfW Efficiency House 55	50 points
Efficiency House 40	80 points
Passive House	100 points
Efficiency House Plus	120 points
Sustainable insulation materials with Blue Angel seal of approval	10 points
DGNB certification or NaWoh (certificate for sustainable building)	10 points

This evaluation has been applied for the majority of the 30 concept tender offer so far. There are no minimum requirements regarding the energy standard of a building. However, a bid scores 0 if only the legally required building standard is met by the bid. A commission consisting of all relevant authorities (local district, ministry for finances, ministry for urban planning and environment) decides over the bids according to these criteria. Exceptions apply for the municipally owned housing company (SAGA GWG) and housing associations. The allocation of property for housing associations is done by the agency for housing associations (part of the ministry for urban planning and environment). (Krämer, 2014)

This tender procedure was used for the plots in Wilhelmsburg-Central and also in the current urban development project Neugraben.

4.5 German and Hamburg funding scheme

There are different financial incentives for renewable energy projects, new housing or retrofitting of existing buildings on the national and municipal level. The KfW Banking Group or KfW is a public financial institution on the national level. The control of legality lies in the Federal Ministry of Finance. The KfW offers, in the field of housing, construction and energy reduction, a wide range of programs that are used to finance investments in residential real estate. The purpose of these funds are the creation of homeownership, retrofitting and refurbishing buildings, the construction of energy efficient new buildings and photovoltaic plants. Since 2006, the federal government provides 1 Bio. Euros annually in the context of the funding initiative “Living, Environment, Growth” to make the CO₂ reduction programs more attractive and to meet national climate protection obligations from the Koyoto – Protocol. There are several loans for different energy standards of buildings (e.g. KfW 55 House), which are better than the legally required standard (EnEv: 2014) (KfW Bank, 2014).

On the city level the IFB Bank (Hamburg bank of Investment and Conveyance/Hamburgische Investitions und Förderbank) also gives out loans and subsidies (Hamburgische Investitions- und Förderbank, 2014). Some of these loans or subsidies from the two different banks can be combined and can make investments in renewable energies or high energetic buildings a profitable business case. These financial incentives were used in some of the IBA projects and also acted as a quality



assurance because they are tied to strict demands, which have to be documented in e.g. an energy certificate (Energieausweis).

4.6 European Funding

The IBA profited from considerable funding from the EU in the context of the European Fund for Regional Development (EFRE) for several projects such as the Energy Bunker (ca. 3 Mio. Euros) and the Energy Hill (ca. 5 Mio. Euros). The fund supported the realisation of the projects.



5. Status of the energy system and related topics

The following chapter describes the energy system in the city of Hamburg and in the SUL in particular starting with the status quo in 2007 and giving an overview of the future development of it by explaining the vision of becoming 100% renewable until 2050. Thus, the first ENERGY ATLAS and the work report ENERGY ATLAS 1, conducted by the IBA, are briefly introduced. The two publications form the analysis of the status quo of the energy system and show how to achieve the vision.

5.1 Status of the Energy System in Hamburg

The following section gives a brief introduction to the energy system in Hamburg with a particular focus on the heat supply. The major urban long distance grid is run by Vattenfall Wärme Hamburg GmbH. This grid is enhanced by a range of local heat grids in areas around the edges or urban districts with a lower heat density. In 2013 the population of Hamburg voted for a buyback of the energy grids. Hamburg's share in 2014 is 25.1 per cent, but the city is set to invest to 100 per cent by 2019, exercising its call option. When the city of Hamburg is the owner of the district heating grid it has great possibilities to convert the heat supply into a more environmental friendly supply.

The following figure shows the final energy demand in Hamburg. The final energy demand for heat is 43% and thus the biggest share compared to transport and electricity.

Figure 3: Final energy demand Hamburg 2011

Endenergieverbrauch Hamburg 2011

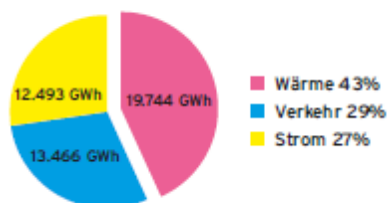


Figure 4: Final energy heat demand Hamburg 2011, shares of fuels

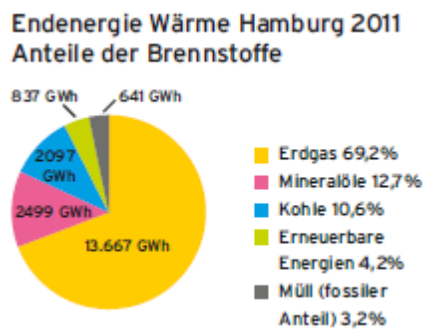
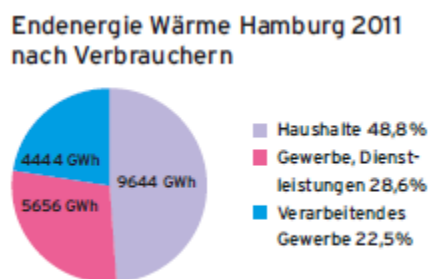


Figure 5: Final energy heat demand Hamburg 2011 per consumers



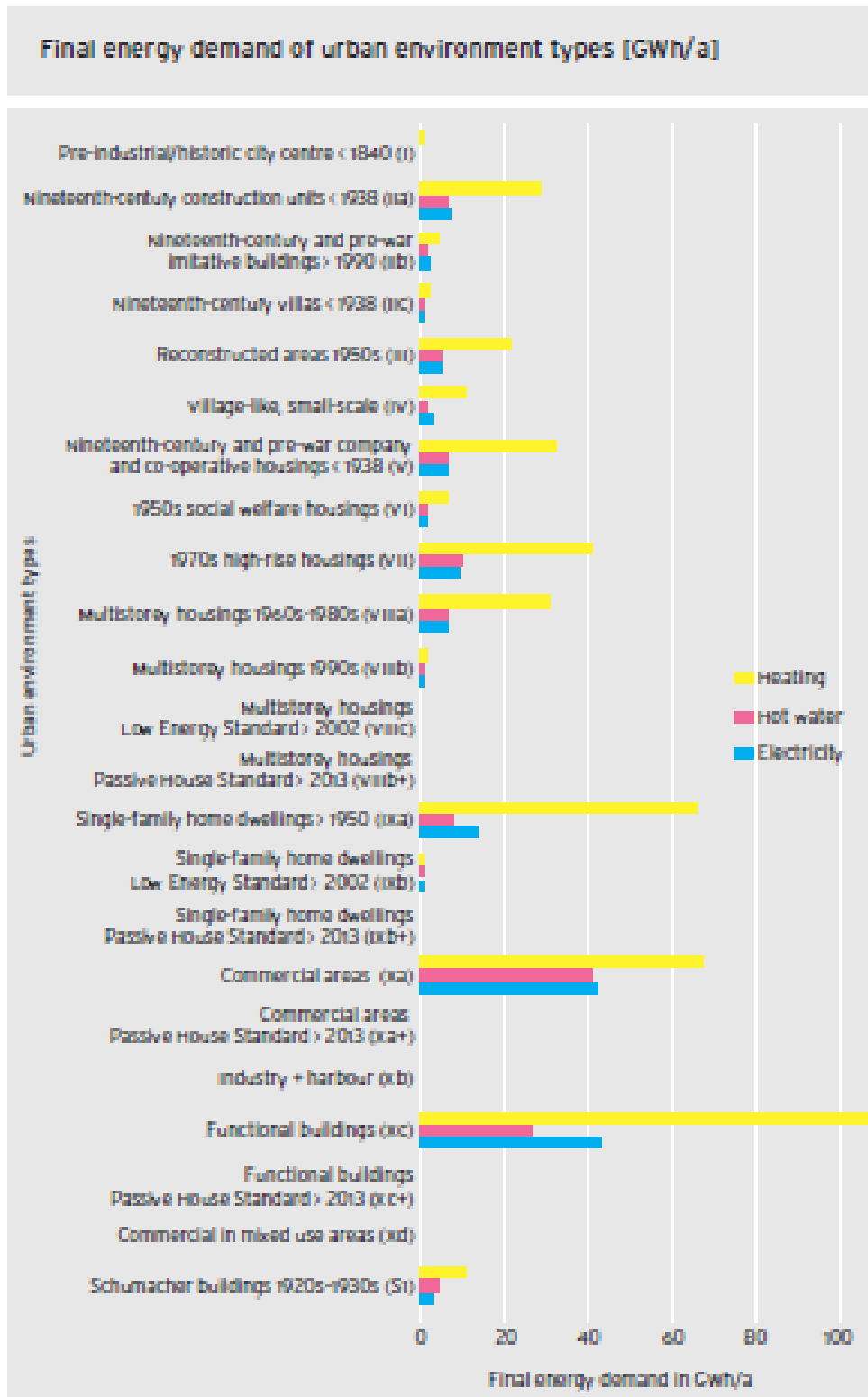
5.2 Status Quo 2007

The following table shows the total energy demands and CO₂ emissions in the IBA area in the starting year 2007. The ultimate energy demand of each building depends on the urban environment type, which is shown in figure 6.

Table 3: Status quo energy system 2007

Heat demand	550 gigawatt hours (of which were 1% from RES)
Electricity demand	143 gigawatt hours (of which were 10% from RES)
Total CO ₂ emissions	200,000 tons

Figure 6: Energy Demand of the urban environment types (GWh/a)





The energy production in the starting year was dominated by fossil fuels in Wilhelmsburg. The area Wilhelmsburg and Veddel are not connected to the central district heating grid of the city of Hamburg and only a relatively small new grid has been developed in Wilhelmsburg. The already existing grid in Hamburg is mainly based on fossil fuels and based on two central plants. Therefore, it was not only the aim but also possible to implement a district heating grid, which is based on renewable energy sources and to develop and test new grid concepts. This would not have been possible with the central grid.

In regards to renewable electricity production wind turbines were put on the Georgswerder disposal site in 2007. Additionally, there were small PV panels on some buildings already.

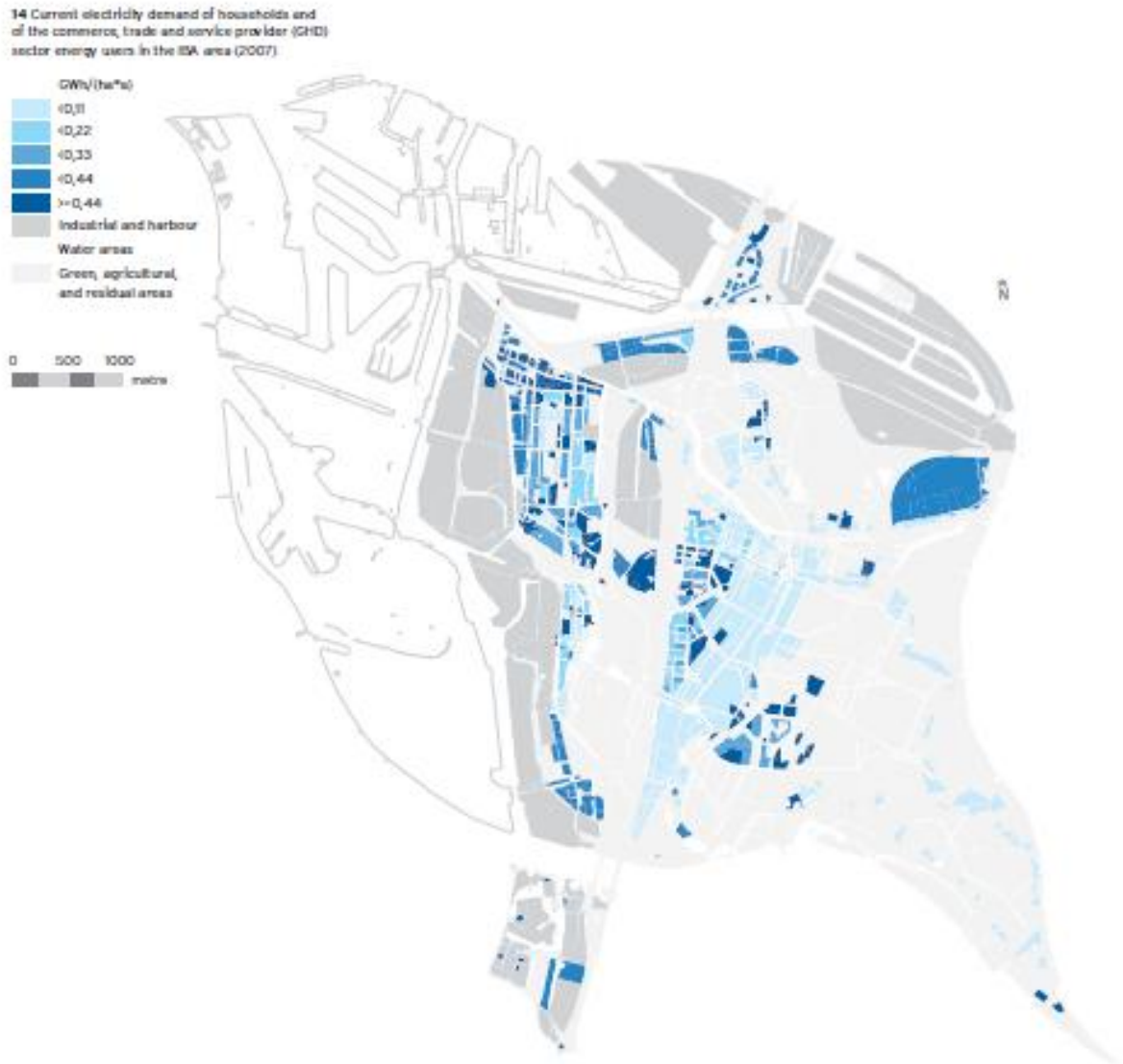


Figure 7: Heat & hot water demand (2007)

13 Current heat and hot water demand of households and of the commerce, trade and service provider (GHD) sector energy users (2007), including processing GHD heat demand, in the ISK area



Figure 8: Electricity demand (2007)



5.3 Vision of a 100% renewable energy supply

The vision of becoming 100% renewable until 2050 is stated in the “Climate Protection Concept Renewable Wilhelmsburg”, which was written from 2008 to 2010 by a consortium of experts (namely the Energy and Climate Advisory Board) and in collaboration with the IBA. The data was taken from a survey on current heating and electricity consumption by residential, service, office and administration buildings on

the island. The results of this survey, probable general consumption trends and measures necessary to convert existing buildings to a state of carbon neutrality were presented in the study “Energy Optimisation of the IBA Hamburg Model Region (“Energetische Optimierung des Modellraums IBA Hamburg”). This study used a scenario analyses to compare future energy demands and potentials for savings, increased efficiency, and the use of renewable energy in the various types of urban environment on the Elbe River Islands, and the development of strategic measurements for the optimisation of energy supplies.

This formed the basis for the “ENERGY ATLAS”, which was published in December 2010.

5.4 ENERGY ATLAS

The results of the study “Energy Optimisation of the IBA Hamburg Model Region”, undertaken in close cooperation with the IBA’s specialist Energy and Climate Advisory Board, form the most important basis for the “ENERGY ATLAS” of the Elbe Islands, and represent the strategic instruments and projects of the Elbe Islands’ future energy supply systems. The aim is the presentation of a spatial energy model for the IBA’s demonstration region. (International Bauausstellung IBA Hamburg GmbH, 2011)

5.4.1 Scenarios

Four different scenarios were developed in the ENERGY ATLAS, two reference scenarios and two excellence scenarios, each for the years 2007 (start of the IBA), 2013 (presentation year), 2020 and 2050. The focus of all scenarios were on the retrofitting of the existing building stock and high energy efficiency standard for new buildings, local production of electricity and district heating grids supplied by RES.

The two reference scenarios are business as usual developments based on German energy saving requirements and the anticipated technical developments over the coming years and not taking the projects IBA into account.

- ★ Reference scenario 1: business as usual case with the IBA area being connected to the Moorburg power plant (coal) via a district heating network
- ★ Reference scenario 2: business as usual case with the IBA area not being connected to the Moorburg power plant (coal) via a district heating network but in



co-existence with likely influence on renewable energy supplies in the IBA area
(Internationale Bauausstellung IBA Hamburg GmbH, 2010)

The two excellence scenarios are based on projects with excellent energy related features and on the IBA's "Renewable Wilhelmsburg" climate concept. The progress of the renewable energy generation and the energy-saving modernisation of buildings are faster and more decisively than in the reference scenarios.

- ★ Excellence scenario 1 is characterized by a strong focus on possible local deep geothermal opportunities, which – if realized – would produce significant yields.
- ★ Excellence scenario 2 focuses on the diversification of renewable energy sources.
(Internationale Bauausstellung IBA Hamburg GmbH, 2010)

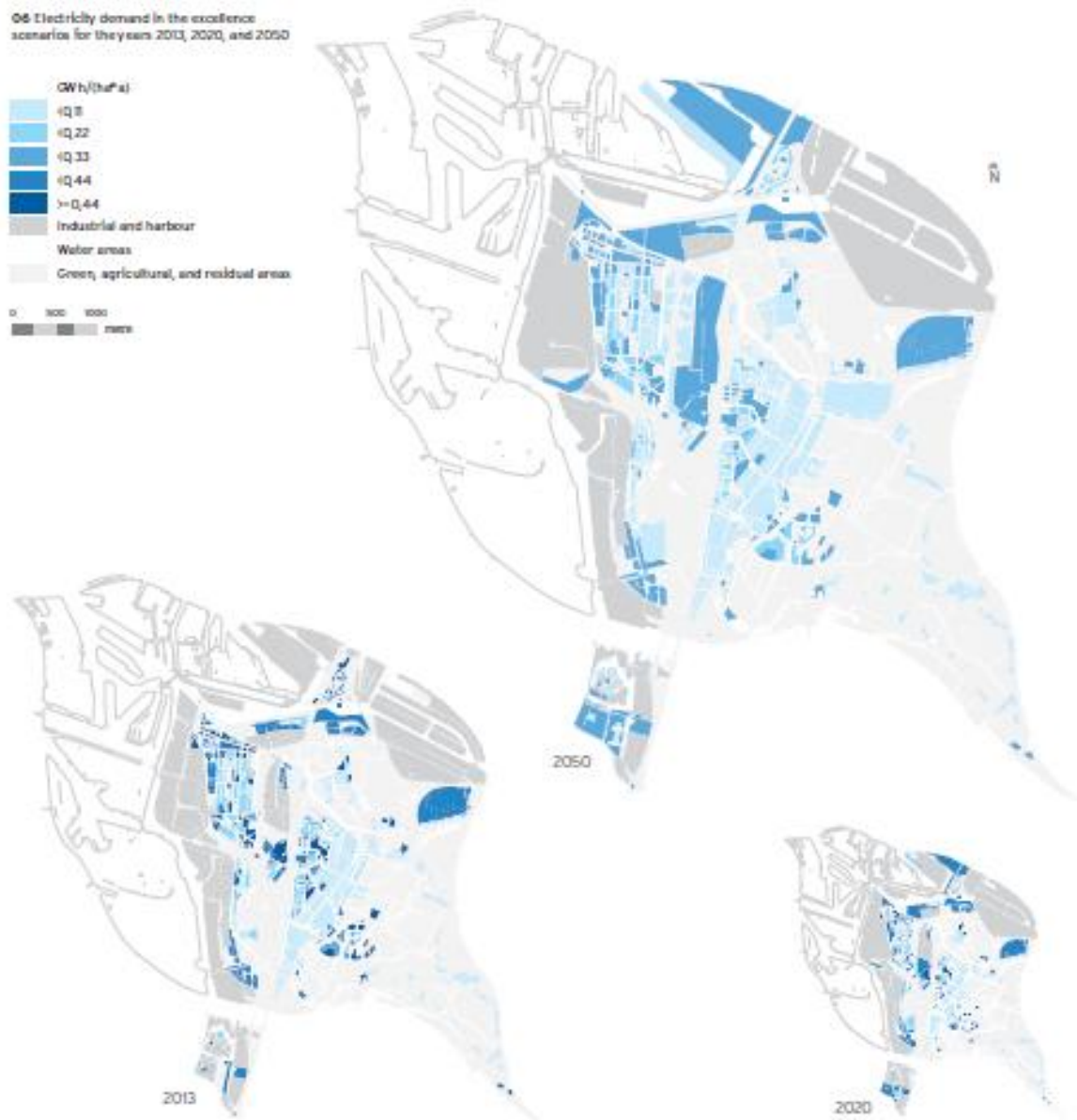
Two so-called "excellence scenarios" were developed as alternatives to the reference scenarios to incorporate concrete IBA projects and also to examine different areas of emphasis in renewable energy supplies. The two scenarios share the fact that they are local and decentralised solutions, which are adapted to the special local ability to achieve autonomy with renewable energy.



Figure 9: Thermal energy demand in the excellence scenarios



Figure 10: Electricity Demand in the excellence scenarios



5.4.2 Conclusion of the ENERGY ATLAS

In reference scenario 1 the projections have shown that the CO₂ emissions can be reduced by 63% until 2050 and by 70% in reference scenario 2. In excellence scenario 1 and 2 the projections have shown that CO₂ emissions can be reduced by 95% until 2050. The result of the survey showed that the Moorburg power plant is an obstacle on Wilhelmsburg's way to become carbon neutral by 2050. All in all, the survey showed that Hamburg's climate protection target of reducing CO₂ emissions by 80% by 2050 cannot be met with the reference scenarios but with the excellence scenarios. In fact, the results of the study demonstrate that it is possible to supply the Elbe Islands by local renewable energy sources by 2050 even if the population grows from 55.000 up to 73.000. In detail, a 100% supply with renewable power is possible until 2025 and a supply of 85% renewable heat until 2050, to make the Elbe Islands nearly carbon neutral until 2050. Even from the starting year 2007 to 2013 it was possible to achieve a CO₂ reduction of 15% equivalent to 25,000 tons. (Internationale Bauausstellung IBA Hamburg GmbH, 2010)

Figure 11: Timeline of the excellence scenario

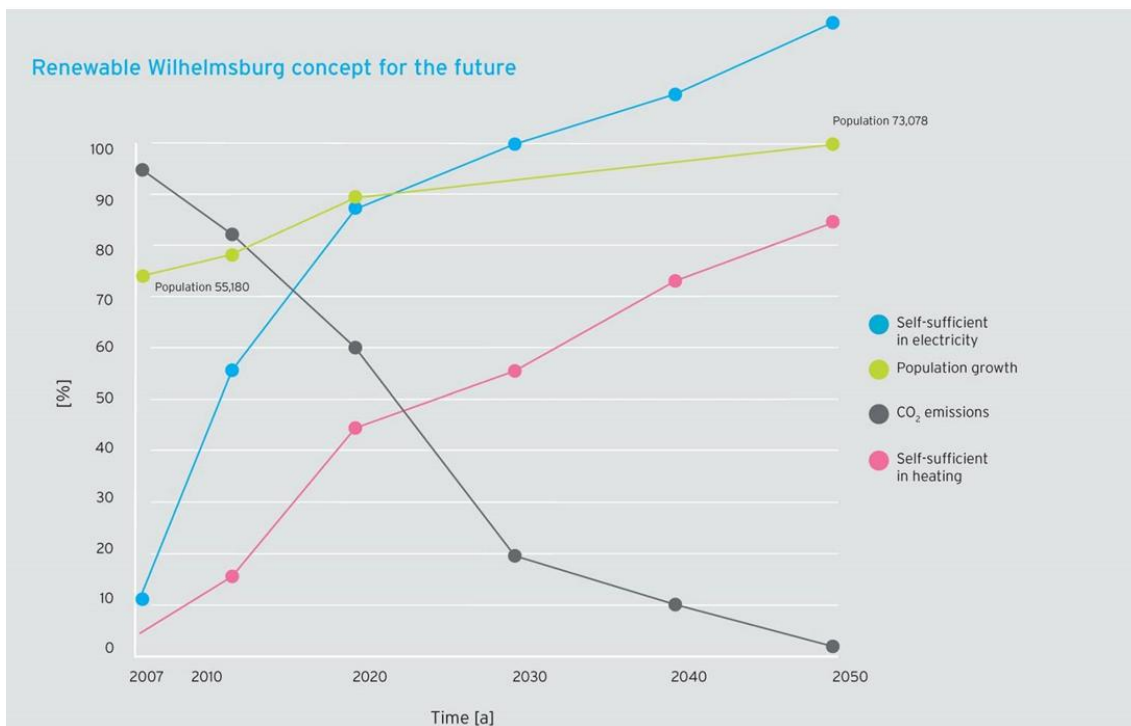


Figure 12: CO₂ reductions in the excellence scenarios



5.4.3 Availability, update and commitment

The ENERGYATLAS and the study “Energy Optimisation of the IBA Hamburg Model Region (“Energetische Optimierung des Modellraums IBA Hamburg”) are available as printed versions. The data is not available for the public.

As there is no “formal commitment” by a governmental petition or proposal, the concept has different aspects of fundamental regards:

The concept was the background of the IBA company to develop the projects of the exhibition until 2013. The company was liable to an advisory board chaired by the Senator of the Ministry for Urban Development and the Environment. Thus, the concept was approved somehow by the high level administration and the political level.

Additionally, the “Climate Protection Concept Renewable Wilhelmsburg” was named as one of the mayor examples of the urban energy transition in the frame of the “Masterplan Climate Protection” of Hamburg.

Additionally, the “IBA partnership” of 150 companies and institutions signed the “IBA declaration” to support the realization of the IBA development and the IBA concepts.

Currently, the IP, based on the climate protection concepts, will be checked by the responsible head of the energy department.

In the future, some of the activities need to be confirmed by different sectors, e.g.:

- ★ Parliament of the Administrative District Hamburg Central for the binding connection to district heating
- ★ Financial Department for higher criteria during tender procedures for city owned building sites
- ★ Ministry for Urban Planning for the administrative and technical support for “Concepts for Energetic Redevelopment of Urban Neighborhoods” (national funding program)
- ★ ...

Although there have been changes during the last years regarding the specific elements of the concept and the basic settings, there are currently no financial resources to further develop or update the data sets and the scenarios. Nevertheless, the concept and the ENERGYATLAS act as proof and evidence to support the target of a climate neutral district.

Additionally, the measures of the “Climate Protection Concept Renewable Wilhelmsburg” were monitored in the context of the national subsidy project “EnEff:Stadt – Research for the energy efficient City” of the Federal Ministry for Economic Affairs and Energy, by the Technical University Braunschweig and by the

Energy Research Centre Lower- Saxony (Niedersachsen). First results will be published as part of the “ENERGYATLAS – WORK REPORT1” in January 2015 and will be discussed during a specialist conference.

5.4.4 IBA Projects to become 100% renewable

For the first step to become CO₂ neutral several different RE projects in the IBA area were realised from 2007 to 2013. A small selection will be briefly introduced in the following part.

An example for a decentralized district heating grid is the Energy Bunker, a former military bunker of the Second World War. In 1947 the interior structure of the bunker was destroyed by British troops and for more than 60 years the monument stood in the western part of Wilhelmsburg as monument of war. Between 209 and 2011 more than 30.000 m³ of rubble was removed. A buffer storage tank holding 2,000 m³ of water was installed in the bunker to take up heat from solar thermal units, waste industrial heat, a wood-chip fired boiler and a biomethane CHP plant. When completed, the energy bunker will supply heating to about 3,000 households and electricity to 1,100 homes. Today the former Bunker serves not only as a regenerative energy plant, but also as a public space with an exhibition on its history and a café with a fantastic view over the skyline of City and harbor of Hamburg.



The “Energieverbund Wilhelmsburg Mitte” (Integrated Energy Network Wilhelmsburg Central) consists of a number of interconnected power generation plants located in

various buildings that form a large “virtual” power station. All nearby residents can feed renewable thermal energy into this thermal grid. A bio-methane-powered CHP plant operated by HAMBURG ENERGIE provides the bulk of the heat supply and also ensures a basic level of service. Solar heat plants located on suitable roofs and facades for example also feed in energy from renewable sources.

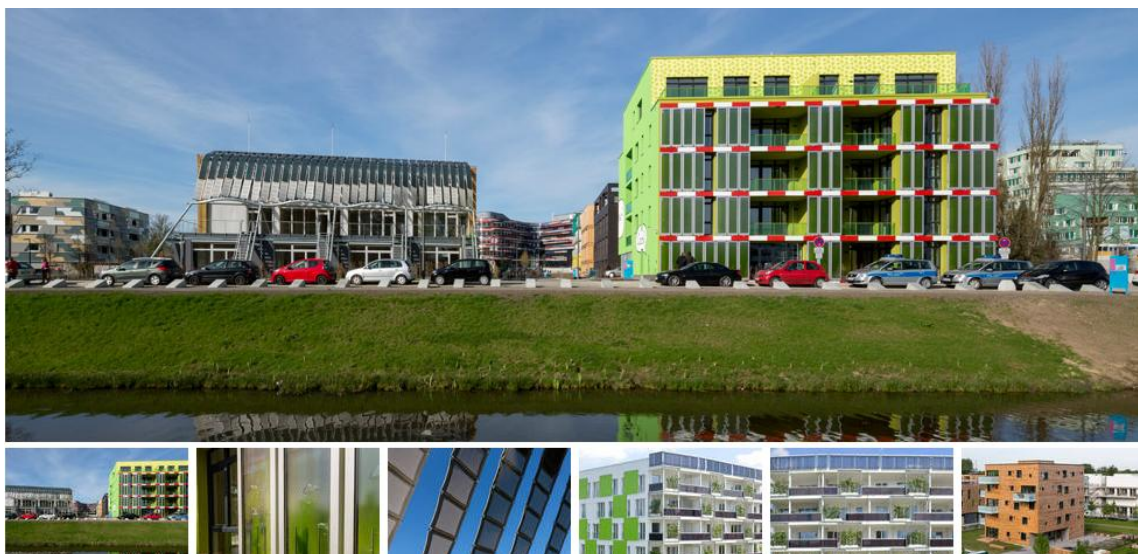


Another iconic technical installation is the Energy Hill. A former toxic landfill was secured, opened to the public and transferred into a place for the production of renewable power. At present a 3.4 MW wind turbine has been installed on the landfill and this, together with another wind turbine and a photovoltaic array covering 1 hectare, generates enough electricity to supply 4,000 households (20% of all households on the Elbe islands).



Several more buildings, especially the “Smart Material Houses” in the show case houses area of the “Building Exhibition within the Building Exhibition” use their facades and roofs to produce their own heat and electricity:

- ★ The algae house “BIQ” can produce as much biomass in glass collectors in the façade to supply around 20% of the houses heat demand.
- ★ The “Soft House” increases the efficiency of its photovoltaic installations by following the sun during daytime and during seasons by flexible membranes.
- ★ The “Smart is Green” produces major parts of its energy demand by vacuum tube solar collectors at the attic and on the roof and by thin photovoltaic areas at the balconies



Biggest retrofitting project is the “Global Neighborhood” (“Weltquartier”) next to the “Energy Bunker” with the energetic refurbishment or demolition and Passive House Standard new construction of 650 residential units.



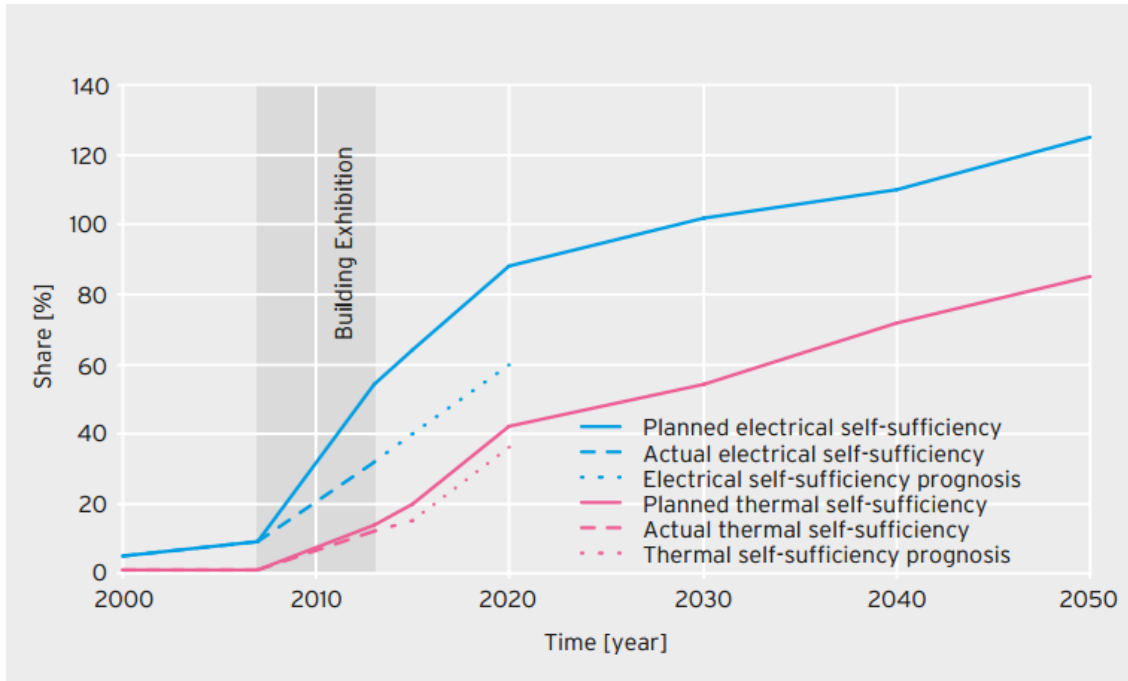
Projects, which have not started or have not been fully realised until the end of the IBA in 2013 are part of the second action plan and are thus subject of chapter 7 further below.

5.5 Status Quo 2013

The status quo for the energy system for 2013 has been assessed by the new work report for the ENERGY ATLAS, which will be published at the beginning of 2015. The conducted monitoring in the context of the research project “EnEff: Stadt” has come to the following results for the energy system in the IBA area:

- ★ The Energy Hill supplies 20% of the households on the island with RES. In 2013 it produced 10,500 MWh electricity.
- ★ The electricity demand has increased by 4% (2007 – 2013).
- ★ The electricity coming from other parts of Hamburg has decreased by 11%.
- ★ On balance 35% of households are supplied with locally produced RES. Originally, 50% were planned for 2013. The smaller result is due to challenges in the implementation of renewable heat supply (see 5.5.1).
- ★ The Energy Bunker produced 3,400 MWh renewable thermal energy in 2014.

Figure 13: Timeline current monitoring results of the share of renewable power and heat production



5.5.1 Heat supply in the climate protection concept “Renewable Wilhelmsburg”

A heat supply, which is as far as possible, climate neutral is one of the four strategic focal points for the implementation of the climate protection concept “Renewable Wilhelmsburg”.

However, crucial in the context of the climate protection concept “Renewable Wilhelmsburg” is that different renewable energy sources can only be used or at least a lot more effectively in a grid connected heat supply rather than in an individual use in buildings. Examples for such renewable energy sources are waste heat, deep geothermal energy and large scale biomass and solar thermal plants. Moreover, the share of CHP plants and solar energy from small decentralised solar thermal plants can be increased by linking them to a district heating grid because of the resulting balance and synergies between the producers and consumers.

As a consequence of the careful planning and use of all options it is possible to improve the CO₂ balance in a relatively simple manner. This is not only advantageous for the environment. The low primary energy factors of district heat which is necessary

to get appropriate funding, can be achieved easily in new and retrofitted buildings without having to invest heavily into the building envelope or heating installations.

The most important condition for an economic and environmental friendly supply with district heat is a sufficiently high heat demand density and good thermal insulation of the grid pipes in order to minimise heat loss. District heating grids are from a technical point of view most suitable in areas with housing blocks, areas with an already existing building stock and areas with large consumers such as swimming pools, who have a high demand. On the other hand, less suitable are residential areas with a low density such as detached houses. Furthermore, due to the higher energy efficiency standard of new buildings, it is necessary to take the low heat density of new built residential areas into account. In these cases it is necessary to look at different options such as decreasing the temperature in the grid.

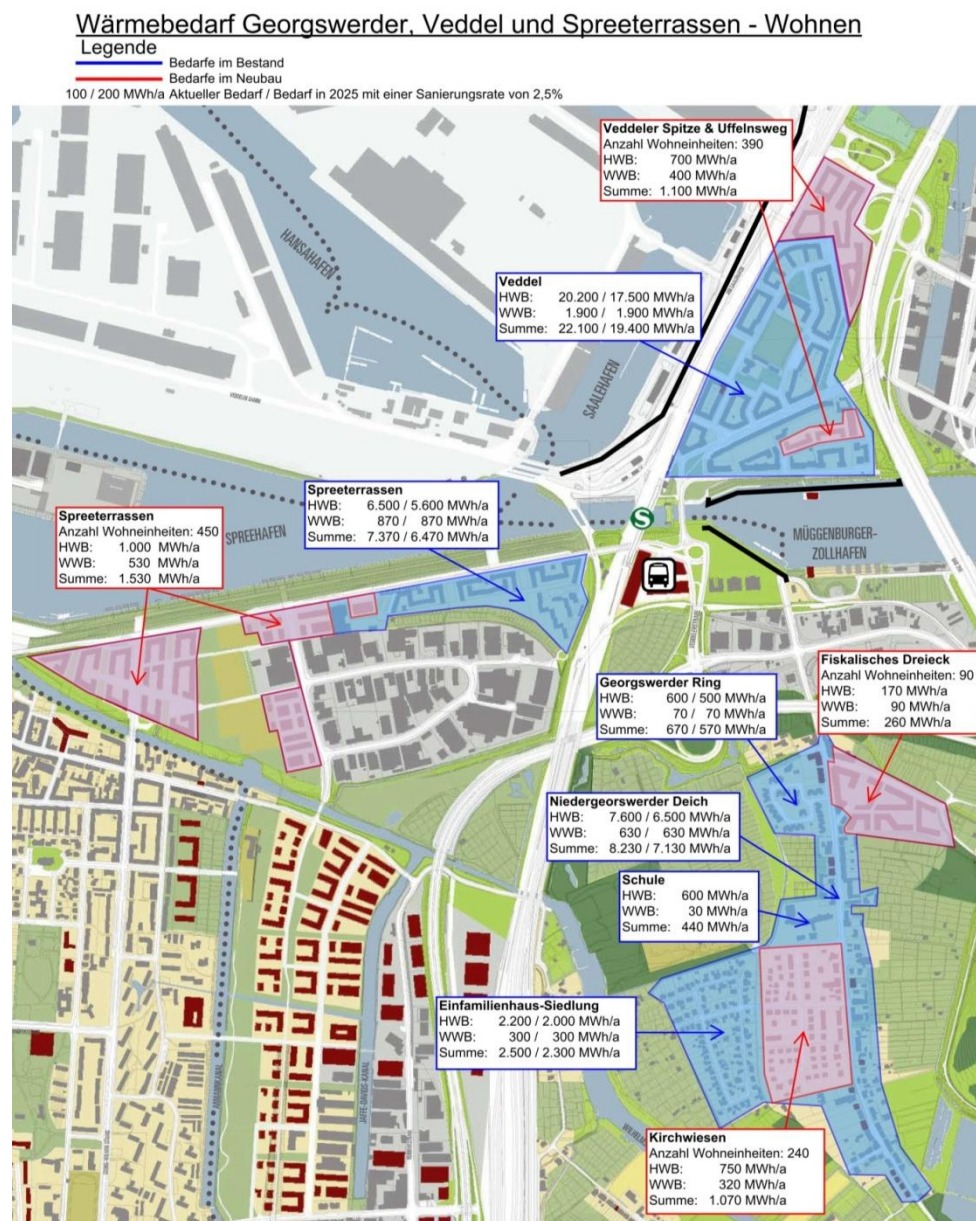
Nowadays, it is very relevant to work with preliminary project management, when implementing grid connected heat supply concepts in development areas. The administration or project management can coordinate the connection and use of a district heating grid with the development and design of an overall concept. Moreover, with such an overall concept the connection to the district heating grid can become a prescription in a layout plan. This also provides security and clarification in regards to the planning of other utility networks such as electricity and gas.

Generally speaking, the only realistic way to reduce CO₂ emissions in a neighbourhood can be achieved with district heating grids, which are jointly coordinated and implemented. Who seriously promotes the benefits of a neighbourhood approach and neighbourhood concepts, (in order to argue against the need or obviousness of insulation and energy-saving measures) has to get engaged more strongly in district heating concepts. Unfortunately, housing companies are still not engaged enough in pushing joint district heating concepts. The activities by the different housing companies, especially across their own plots, are not sufficient enough in regards to their financial and work force input. Additionally, especially individual property owners have a lack of knowledge as well as a lack of a platform or network, where they could develop common concepts. The principles of a neighbourhood concept and a neighbourhood manager from the “reconstruction” bank (KfW) program called energetic

urban regeneration could be helpful to deal with the dilemma. However, this is neither sufficiently employed by the local administration nor by housing companies.

Nevertheless, the climate protection concept renewable Wilhelmsburg projects that until 2050, the heat supply in all areas with an increased density will be provided through different district heating grids in order to utilise the potentials of district heating fully.

Figure 14: Heat demand Georgswerder, Veddel & Spreeterrassen





5.6 Other important issues

Climate adaptation is only a minor topic in the SUL. One pilot project called “Kreetsand” has been conducted together with the Hamburg Port Authority (HPA). The objective is to provide the Elbe River with additional space for flooding in the eastern part of the island. It also reduces the tide action and the sediment input for the harbour.

Additionally it takes design and landscape aspects as well as nature protection and free time activities into account.



6. Overall development vision, objectives and targets, future organisation and management of the SUL

The work report for the ENERGY ATLAS does not only present the results and outcomes of the climate concept renewable Wilhelmsburg but also investigates which consequences have resulted for the roadmap from the different legislative changes on the national and federal state level. Due to different EU targets and a different setting on the national level, e.g. the EEG 2014, and on the federal level, e.g. the future heat strategy for Hamburg, it is not possible to implement the roadmap without any adjustments. Future tasks are formulated e.g. the intelligent connection of decentralized heat and electricity production as well as decentralized storage technologies. Lastly, recommendations for the continuation of the climate concept renewable Wilhelmsburg are given. The overall aim is still to achieve a climate neutral district.

6.1 Recommendations for the continuation of the roadmap

The experience has shown that the strategic fields of actions formulated in the ENERGY ATLAS have been useful. Thus, the recommendations of the work report are done in the context of these fields.

6.1.1 Energy efficiency for new buildings

The current housing policy in Hamburg does not tighten the legal requirements for insulation and energy of buildings on the municipal level. Therefore, optional higher energy standards could be demanded when plots are sold. The so called “Concept tender offer” already applies for the sale of city owned plots. At least the building standard of EnEV 2009 minus 30% or the current standard Efficiency House 55 should apply for future buildings and could be a criterion for these concepts.

Experience shows that savvy architects, investors and developers relatively unproblematic and virtually cost-neutral comply with these minimum standards, if not to surpass them. Practice has shown that the occasionally criticized increased construction costs are often not only due to higher material and labour costs, but are at

least partly down to deficiencies in the design and construction management as well as errors in employing unsuitable, supposedly cheaper planners and entrepreneurs.

If possible new buildings should be connected to renewable district heating grids. When this is not possible the heat supply should come from local resources such as biogas, biomass or renewable electricity. Moreover, the integration of PV in the design of a building should be mandatory. The LifeCycle approach and sustainable building material should also be criterion for the procurement of buildings.

6.1.2 Retrofitting of the existing housing stock

The existing housing stock is of great importance for the implementation of the climate concept. The problem is the very low retrofitting rate not only in the IBA area but also nationwide. This is still the biggest challenge when trying to achieve the long term climate protection goals. The experience of the “Top- Climate Plan” has shown that the increase of the retrofitting rate cannot be achieved through short term and one time only actions. To be more successful, it is necessary to provide a targeted and competent consultation for local residents possibly through integrating local associations, organisations or other local networks.

The low heat density of areas dominated by single family homes makes a grid-connected heat supply both financially and energetically inefficient or at least difficult to implement. Thus, concepts for decentralised CO₂ neutral heat concepts should be developed as alternatives.

The implementation of retrofitting measures and the integration of RES in buildings should be supported through better funding especially for home owners and home owner associations. The focus should be especially on a district wide concept for regeneration.

6.1.3 Renewable district heating grids

Several RES are only useable in a grid connected heat supply or are at least considerably more efficient than when used separately in individual buildings. The focus should be on intelligent heat assemblages in the future. Therefore the recommendation is to pursue this development. That means for the Elbe island specifically to expand and further develop the open district heating grid in

Wilhelmsburg- Central. Moreover, the Energy Bunker and its grid should be expanded to supply 3,000 households, which require more coordination with potential consumers nearby. Additionally, the project deep geothermal should finally be implemented and realised to ensure long-term and stable energy supply for the consumers and to realise a pilot project for northern Germany. For the new development areas in the vicinity of Wilhelmsburg-Central should be a district heating grid mandatory through the climate act. Beforehand this requires a heat survey on the density and feasibility of district heating in these areas. An overall aim for these areas should be to ensure climate neutrality in the local plans, urban development contracts and for the procurement of the grid. A local district heating grid should be developed in connection with an energetic urban regeneration concept for the existing areas Veddel and Kirchdorf-South.

In this further development and expansion of the district heating grid in the IBA area other innovative technologies should be used such as “Power-to-Heat”.

6.1.4 Renewable electricity production

The climate protection concept renewable Wilhelmsburg is based on a future electricity supply, in which central large-scale systems such as off- and onshore wind farms and decentralized CHP plants, photovoltaic units and several individual wind turbines complement each other. However, the legal and political setting has changed since 2010. This approach is also reflected in the Island Electricity survey, in which the possibilities of the network integration and load management are examined for both the central and decentralized supply. In a next step it has to be substantiated which are the still existing potentials for a decentralised electricity supply under the current conditions. This approach and work should be pursued by a future coordinator of the climate protection concept. Furthermore, innovative concepts like “Power to Heat” and “Power to gas” should be implemented exemplary.

For areas, which are not connected to the district heating grid the use of small CHP plants should be increased by informing and supporting potential consumers. The use of PV is the easiest and low-threshold form of decentralized electricity production. This should be utilised in form of e.g. facilitating energy cooperatives. To increase the profitability of own produced electricity and at the same time to relieve the grid

infrastructure, it should be aimed at the highest possible use of own produced electricity. This could be achieved by an exemplary implementation of Plus-Energy houses or Plus-Energy neighbourhoods. Moreover, an organisational and technical expansion of personal energy usage is necessary.

Lastly, existing wind turbines should be repowered and new locations for new and more wind turbines should be identified and implemented.

6.2 Frame work conditions for the continuation of the roadmap

In addition to the technical and administrative individual measures of the future roadmap of the climate protection concept a framework has to be defined that must be considered in the further implementation of the concept. These are often valid not only exclusively for the Hamburg Elbe islands, but for the entire city of Hamburg and even nationwide.

6.2.1 Participation and Involvement of local residents

The good foundations of the realized IBA projects and the climate protection concept should be utilized to make local residents even more to actors for the climate protection on the Elbe Island. The experience has shown that collaboration worked especially well when local associations and organizations were involved, who knew about local peculiarities in regards to buildings and spatial design. Therefore, for a successful cooperation with local actors in the field of energy and climate change the strengthening of local networks and the expansion of networking is of particular importance.

6.2.2 Support for the politics and mainstreaming of the administration

The climate protection concept renewable Wilhelmsburg is an internationally highly respected and excellent pilot project of the IBA, which made Hamburg a pioneer in the energetic urban regeneration. This position is to be maintained only by additional efforts even after the end of the IBA. In the future it will be about unlocking additional sources of funding to continue the climate protection concept Renewable Wilhelmsburg and to continue the pilot projects. This is not only in the interest of Hamburg, but also of interest for the national climate change policy.

6.2.3 A coordinator for the continuation of the climate protection concept

The political and financial support for the continuation of the climate protection concept forms the basis of the work. However it is just as important to work actively on the issue of climate change together with builders, housing associations, transport planners, engineers and the local residents on the Elbe River Island. So that people can identify with abstract issues such as climate change and climate protection and take action for their district. For the first years the IBA Hamburg has largely taken responsibility for implementing the concept. The IBA has raised funds, coordinated the activities of different actors and has always dealt with the difficulties and tried to develop solutions that are based on the overall target and not on individual interests. The IBA has worked together with the politics and administration of the city of Hamburg on the overall target and made Hamburg a frontrunner in matters of climate protection.

For the continuation of the climate protection concept renewable Wilhelmsburg a coordinating function is still necessary to get from singular interests of actors to a common concept and an integrated planning. The Elbe islands consist of numerous small neighbourhoods. Thus, it makes sense to look at them in individual neighbourhood managements and to find tailor-made implementation solutions.

For this it is important that the City of Hamburg, based on the experiences of the IBA develops new forms of binding and project-oriented cooperation of all stakeholders and applies them. In this context, the possibilities of the KfW program for the energetic urban regeneration should be used, which finances district concepts and managers. The necessary additional financing should be, if needed, shared by the authority, borough, housing associations, commercial enterprises and utility companies, to on the one hand minimize the costs for everyone involved and on the other to maximize the financial advantages compared to individual actions.

6.2.4 Drafting of more modules for the climate protection concept

The expectation to include more sectors in the coming years in the climate protection concept renewable Wilhelmsburg was already in the ENERGY ATLAS from 2010 formulated. In particular, the issue of mobility is important to be considered in more detail and also to develop customized solutions for the Elbe islands. Transport is not only a major source of CO₂ emissions, the synergies between urban development and

transport are more than obvious. In addition, in perspective other sectors such as the urban infrastructure and industry should be integrated in this process because the industry is both the largest emitters of greenhouse gases but also has the largest reduction potentials. At the same time, as shown in the example of the use of industrial waste heat in the energy bunker, many synergies can be utilised in this sector.

6.3 Future organization and management of the SUL

The organisation IBA has been prolonged for another three years to develop three areas in Wilhelmsburg and two in Harburg. The IBA is using its existing knowledge about the peculiarities of the island and its existing network of partners for the new development areas. Moreover, the same energy efficiency standards for the new buildings apply to pursue the innovation and sustainability started by the IBA in 2006. The priorities for the future development are to create housing units inside the City of Hamburg to counteract the increasing housing demand and the suburbanisation of the city. The focus for these new developments is to be sustainable, affordable and for different generations.

However, it is necessary to have someone who coordinates and facilitates the individual projects and also initiates new ones. The outstanding trait of this concept is that it involves many different projects, which work together and use the synergies from the different sectors and systems. This would be lacking if no one is responsible for the concept. This person or entity could be someone situated directly in the ministry or an external. The monitoring conducted in the context of the research project “EnEff: Stadt” has been prolonged until March 2016.

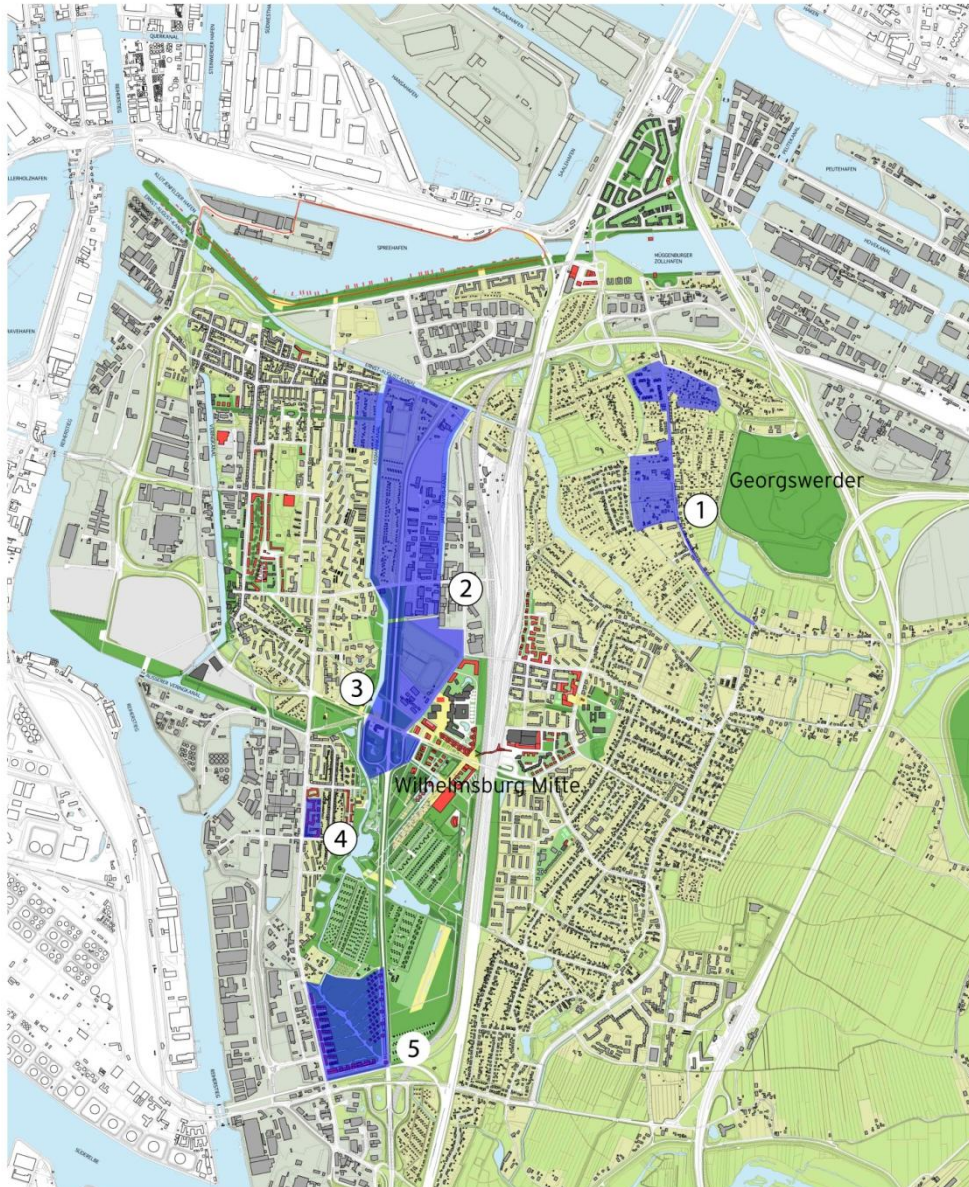
7. Implementation measures

In the following chapter the different measures, which are still being processed and have not been realised are presented.

7.1 Urban development

As mentioned above the IBA has been appointed to develop several new urban development projects in the IBA area after the IBA has finished in 2013. The City of Hamburg aims to build 6.000 new housing units every year to meet the strong housing demand in the growing city. There are good conditions for new housing developments in Wilhelmsburg especially in close connection to the new urban development of the IBA and the relocation of the main road. Georgswerder is one of the areas in which the rural potential and the close proximity to the city centre can be mobilised and developed. This process already started in 2013 with the ambitious participatory process “Future Vision Georgswerder 2025”. The new insights from this process will be used in the future urban development in Georgswerder. Furthermore, the masterplan Wilhelmsburg-Central will be pursued with the new development on the main road. The new development will draw from results and recommendations from the “Future Vision Elbeisland” and the participatory process “Perspectives – planning together for the Elbeisland”. These new projects will be briefly described below. For some of these areas the IBA is also responsible to develop a heat supply concept, which has been elaborated in 5.5.1 already.

Figure 15: Current IBA development and examination areas



Projektgebiete der IBA Hamburg GmbH
(Stand: 26.11.2013)

- | | | |
|--|-----------------------------|------------------------|
| 1 - Zukunftsbild Georgswerder -
Wilhelmsburg 81, Sinti Siedlung
Nieder-Georgswerder Deich,
Fiskalische Straße | 2 - Zentrale Nord-Süd-Achse | 4 - Georg-Wilhelm-Höfe |
| | 3 - Drateinstraße | 5 - Haulander Weg |

7.1.1 Georgswerder

Start of implementation	2012	(Planned) Completion	2025
Description of the measure	<p>A future vision for the Georgswerder neighbourhood in the north eastern part of the Elbe island was created during a participation workshop with local residents (Figure 15). Three different areas were defined, for which a planning competition was hosted:</p> <ul style="list-style-type: none"> – Kirchenwiese New residential buildings – Triangular Fiskalische Str. residential friendly businesses and potentially living – Niedergeorgswerder Deich New residential & mixed use buildings in vacant plots <p>Development of a new central area</p> <p>The overall aim of all three development areas is to stabilise the existing shopping infrastructure and the school location through an increase in residents and jobs.</p>		
Status Quo	The different urban planning designs are awaiting a final decision from the local authority.		
Next Steps	The local plans have to be adjusted in order to make the urban planning designs feasible and possible to realise. The noise impacts have to be analysed.		
Key-actors	Residents, Planning offices, local citizen groups		
Target group	Businesses, citizens		
Financing			
Publicity, participation	Participation workshop “Future Vision Georgswerder 2025”		

Figure 17: First urban development design for Georgswerder



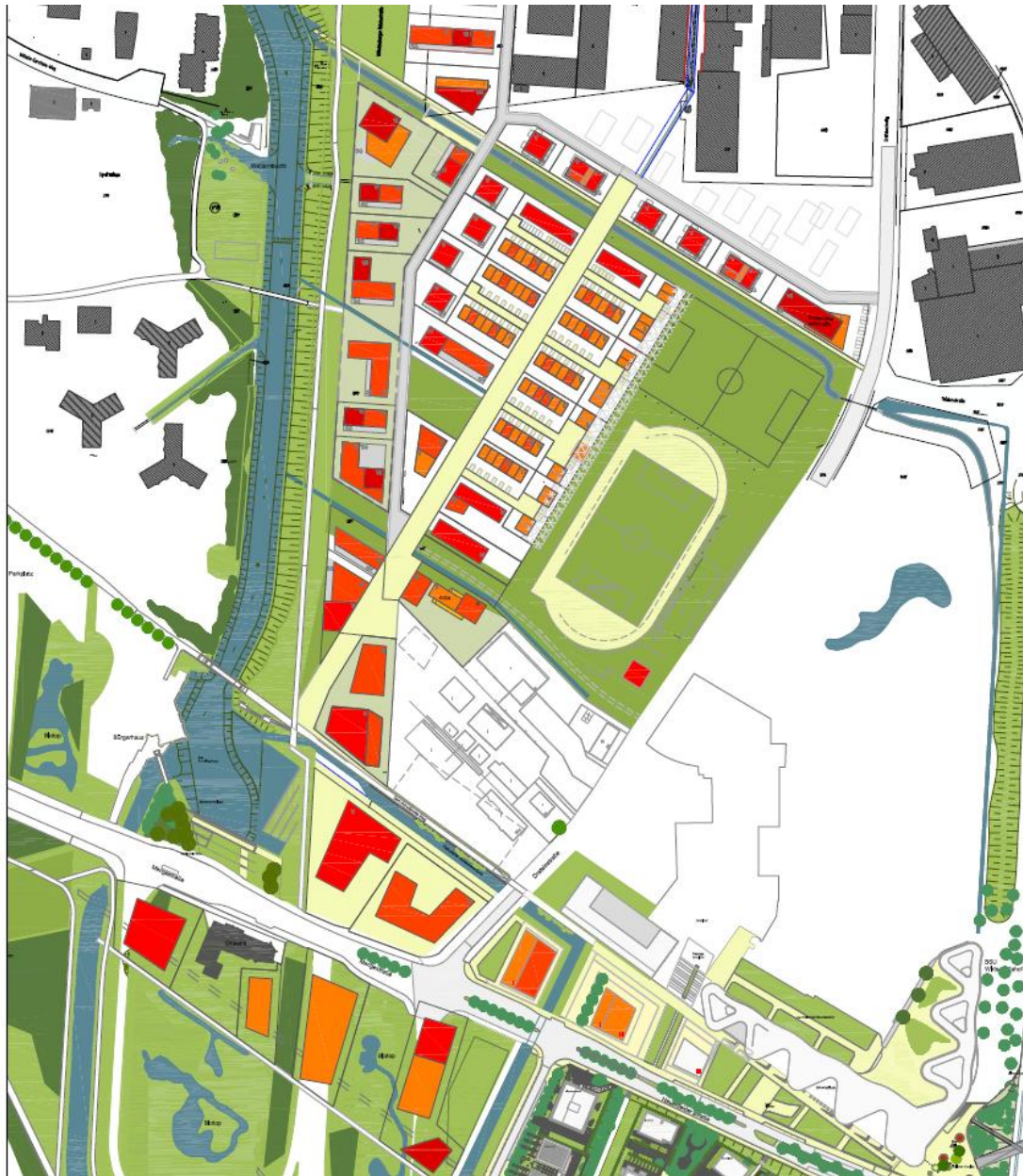
| Teilgebiet Kirchenwiese – Lageplan Phase 2 Perspektivische Entwicklung – M1:1500 |



7.1.2 Dratelnstr. (Wilhelmsburg-Central)

Start of implementation	2014 pre- planning 2017/2019 start of development	(Planned) Completion	
Description of the measure	The 30 ha area is adjacent to the Island Park and in the vicinity of the S-train stop “Wilhelmsburg” and will expand the Wilhelmsburg Central area considerably. For the future residential buildings the “One third mix” rule from the “Alliance for Living” will be applied, which means that one third of the apartments will be social housing, one third property owned and one third free market rent. A total of 1000 housing units will be build. The innovative buildings in Wilhelmsburg Central will be brought into the production stage in this new area. The particular challenge of this area will be the compability of housing next to modern, attractive sports facilities and the integration of the main road embankment. Moreover, the aim is to create a more lively area next to the new ministry building with shops, nurseries and business.		
Status Quo	The site is divided into two different building phases. The tender offer is finished for the area with a winner design for the area.		
Next Steps	The urban design has to be re-adjusted to increase the density. Conducting a “Concept tender offer” to sell the plots.		
Key-actors	Local businesses, local sports club		
Publicity, participation	Talking directly to the involved local businesses and hosting participatory events “Perspectives! Planning together for the Elbe islands”.		

Figure 18: Urban development design for the Dratelnstraße



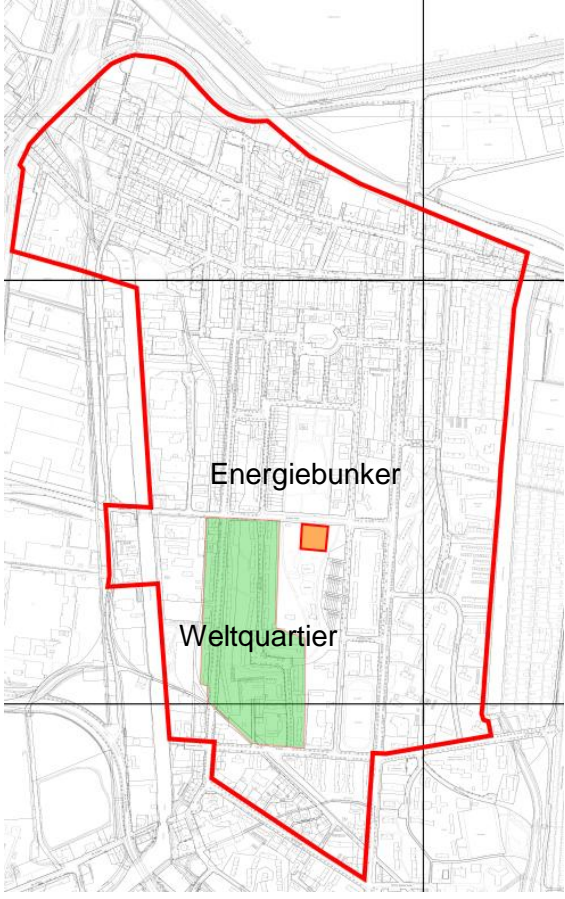
7.1.3 North-South-Axis (Nord-Süd-Achse) (Wilhelmsburg Central)

Start of implementation	2014 planning 2018 start of development	(Planned) Completion	Currently on hold
Description of the measure	Through the future relocation of the main road ("Wilhelmsburger Reich Str.") new plots are available for urban development in the central north-south axis between the vocational school and the Ernst-August-channel. The goal is an integrated, cooperative neighbourhood development with the result of a socially and functionally mixed-use district in which the acceptable neighbourhood of residential, commercial, allotments, sports facilities and public open spaces are combined with high energy standards for a particular brand of high urban quality of life. 2,000 new housing units are going to be built.		
Status Quo	The project is on hold due to substantial necessary transformation and change in regards to rental contracts and other legal constraints in this area.		
Next Steps	Conducting a tender competition for the urban design and developing necessary local plans.		
Key-actors	Lobby groups, allotment associations, local businesses		
Publicity, participation	Strong involvement of the local businesses and hosting participatory events "Perspectives! Planning together for the Elbe islands".		

7.2 Energy System

7.2.1 Extension of District Heating Grid "Energy Bunker"

Start of implementation	2006	(Planned) Completion	first stage 2013/14, finalised 2015
Description of the measure	The former air raid bunker in Wilhelmsburg has been transformed into an energy bunker, which supplies the neighbouring households with electricity and heat. The existing district heating grid will be extended in order to supply the northern "Reiherstieg area" as well.		
Status Quo	<p>The energy bunker is realized with a buffer storage of 2000 m³, which stores different renewable thermal energy that is produced inside and on the surface of the bunker. The 1350 m² solar thermal plant, the biogas CHP plant with a thermal capacity of 625 kW and an electrical capacity of 510 kW and the peak load natural gas boiler with a capacity of 2,150 kW all feed their heat into the storage.</p> <p>Currently, the integration of waste heat from a close by industry is in a planning and implementation phase. Until the end of 2015 it is further planned to implement a wood chip boiler with a capacity of 2,000 kW inside the bunker.</p> <p>Furthermore, it is evaluated whether the storage of the energy bunker can work as a "power to heat" location. In this process excess wind electricity is used to produce heat through heating elements instead of having to "dump" excess electricity. As a result, it is possible to reduce the use of resources such as biogas or biomass.</p>		

	<p>The energy bunker supplies 650 households from the “Weltquartier”, small businesses in the “Weltgewerbehof” and the “Language and Movement Centre” with renewable district heat as well as several buildings of a kindergarten.</p> <p>The next expansion step is to supply another 900 households, a youth centre and a school.</p> <p>In total the energy bunker is supposed to supply around 3,000 households with renewable heat.</p>
<p>Next steps</p>	<p>Figure 19: Future supply area by the Energy Bunker</p> 
<p>Key-actors</p>	<p>Hamburg Energie GmbH</p>
<p>Target group</p>	<p>several housing companies, public institutions or private owners (SAGA GWG,...)</p>
<p>Financing</p>	<p>Business model for Hamburg Energie, lower energy costs for residents, Subsidies by Federal Subsidy Bank KfW? ERDF – European Regional Development Fund</p>
<p>Publicity, participation</p>	<p>so far: project dialogues future to be discussed</p>

7.2.2 Implementation of Deep Geothermal District Heating Grid

Start of implementation	2006	(Planned) Completion	first stage 2016
Description of the measure	In 2010 it was found out that in the area of Wilhelmsburg it is possible to extract geothermal energy from the ground. In a depth of 3,500 m water with a temperature of 130 ° C was found that could be used for heating. Therefore a new district heating grid based on deep geothermal will be installed to supply the southern “Reiherstieg area”. The decision on the implementation was made in 06/2013. The district heating grid will supply an industrial company, a hospital and several existing housing stocks		
Status Quo	Research about the potentials, Decision on implementation made		
Next steps	Negotiations between the energy supply company (cooperation of Hamburg Energie and the industrial company) with further potential users Realization of the drilling and the installations		
Key-actors	GTW Geothermie Wilhelmsburg, a cooperation between Hamburg Energie GmbH and a local industrial company		
Target group	Hospital, several housing companies, public institutions or private owners (SAGA GWG,...)		
Financing	Business model for the investor, lower energy costs for customers, subsidies by Federal Subsidy Bank KfW?		
Publicity, participation	so far: project dialogues future to be discussed		

7.2.3 Extension of District Heating Grid “Wilhelmsburg Central”

Start of implementation	2006	(Planned) Completion	first stage 2013
Description of the measure	To supply the central Wilhelmsburg area, the already existing district heating grid of the “Integrated Energy Network” will be extended. After the transfer of the highway “Wilhelmsburger Reichsstraße” next to the railway tracks, a new development area with a potential of up to 4.500 units is available.		
Status Quo	So far, 16 different projects with up to 23 separate buildings or parts of buildings with a total thermal power of 4.2 MW are connected to the 2 km long distribution network. Realized grid in the already developed area		
Next steps	The IBA is currently in charge of preliminary planning and analysing potentials for the areas on the north-south axis and Dratelnstraße north of the existing local supply area, which is covered by the district heating network. In the vision “Elbinsel 2013+” it is planned to build on the development area of the north- south axis approximately 2,000 new residential units and		

approximately 117,000 m² of new space for service and commercial for the medium term.

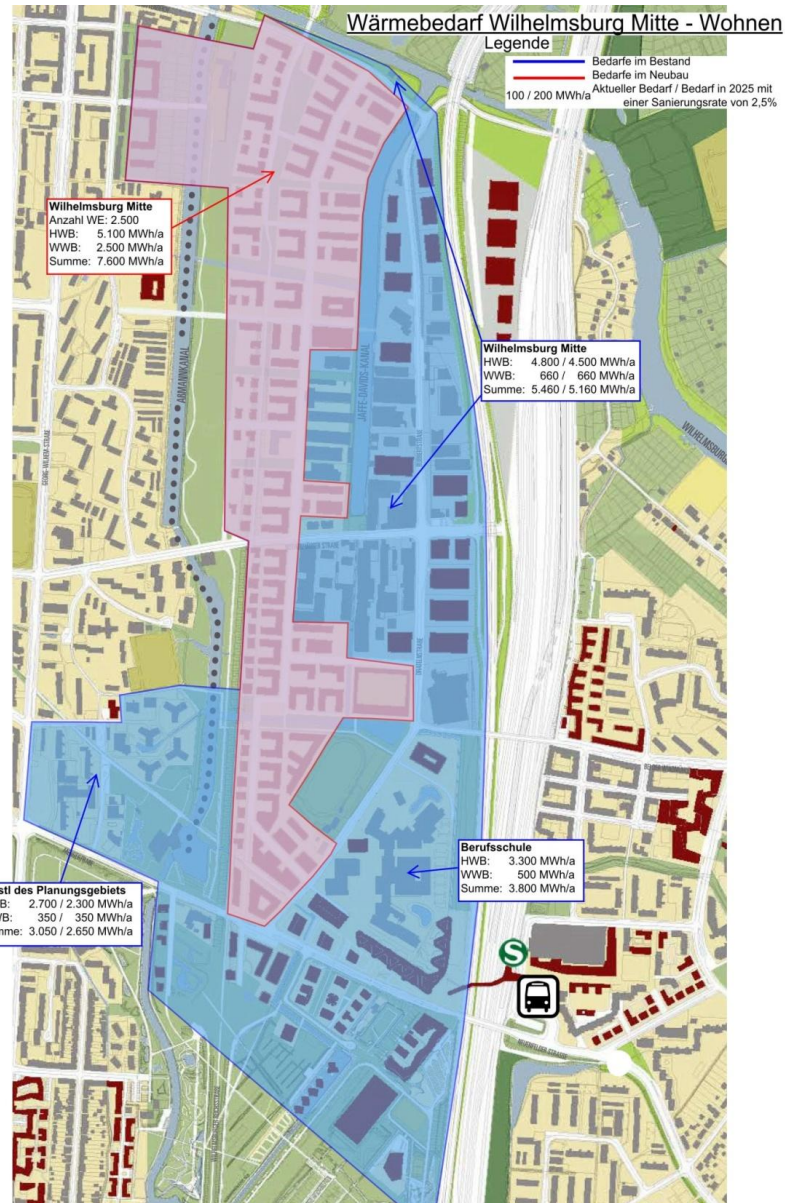
In the summer of 2014 the IBA has carried out an urban and landscape planning qualification process for the Dratelnstraße area. The results of it are to build approximately 1,200 new residential units (incl. a student hall with about 200 places) and approximately 12,000 m² of new commercial space in two different building phases.

Furthermore, another commissioned energy report is looking at the expansion of the district heating network for the new development area. The connection to the district heating network needs to be prescribed in the layout plan. The integration of a binding article in the new Land Use Plan to connect all new developments to the district heating is possible. Afterwards, the concession for the delivery of heat has to be tendered.

Negotiations between Hamburg Energie GmbH and several different investors will go on about the connection. The development of an area north of the vocational school is a potential additional consumer of the district heat.

The necessary capacity expansions could either be covered by another CHP in the existing headquarter of the district heating network beneath the forecourt of the BSU. Or another option is to replace an old CHP plant in the vocational school with a new one that not only covers the demand of the school but also feeds in the district heating network.

Figure 20: Energy demand at Wilhelmsburg Central



Key-actors	District Hamburg Central, Hamburg Energie GmbH
Target group	several bigger or smaller investors, existing companies and institutions
Financing	Business model for Hamburg Energie, lower energy costs for customers, Subsidies by Bank KfW?
Publicity, participation	so far: project dialogues future to be discussed

7.2.4 Development of new District Heating Grids in Kirchdorf-Süd and Veddel

Start of implementation	2013	(Planned) Completion	ongoing
Description of the measure	<p>The supply of the two areas Kirchdorf-Süd and Veddel with a new district heating grid is in a preliminary planning phase. An energy report about the usability of waste heat from the copper company Aurubis AG concluded that only waste heat with a temperature of 35-40° C could be extracted. However, this temperature level is not high enough to provide heat in existing buildings on the Veddel, which means that in the future only new and retrofitted buildings could be supplied with this heat. Thus, the costs are too high and the grid not feasible.</p> <p>Recent development shows that Aurubis AG is looking at possibilities to extract waste heat with a temperature of 85-90°C, which would be useable in existing buildings without any additional investment costs for e.g. heat exchangers. This waste heat could also be used for the supply with warm water, which increases the capacity utilisation of the waste heat and decreases the costs.</p> <p>In Kirchdorf-Süd it is considered to retrofit the existing high-rise buildings from the mid-70s, which is likely to be a relatively easy task because only very few owners would be involved. In terms of heat supply it is thought of pooling the different buildings and to supply them with heat from a biogas CHP plant.</p>		
Status Quo	Mentioned in the Climate Protection Concept		
Next steps	Negotiations between Hamburg Energie GmbH and several bigger or smaller housing companies (SAGA GWG,...) about the development of a new district heating grid		
Key-actors	District Hamburg Central, Hamburg Ministry, Hamburg Energie GmbH		
Target group	several bigger or smaller housing companies, existing companies and institutions		
Financing	Business model for Hamburg Energie, lower energy costs for customers, subsidies by Federal Subsidy Bank KfW?		
Publicity, participation	to be discussed		

7.2.5 Development of new District Heating Grids in Harburg area

Start of implementation	2010	(Planned) Completion	ongoing
Description of the measure	To supply the Harburg harbour area, there are ideas to develop a new district heating grid.		
Status Quo	Several decentralized projects or concepts		

Next steps	Feasible Study
Key-actors	District Hamburg Harburg, Hamburg Ministry
Target group	several bigger or smaller housing companies, existing companies and institutions
Financing	Business model for investor, lower energy costs for customers, subsidies by Federal Subsidy Bank KfW?
Publicity, participation	to be discussed

7.2.6 Efficiency of New build and Sustainable Construction

Start of implementation	2007	(Planned) Completion	ongoing
Description of the measure	<p>All new buildings at IBA development areas have to have a minimum energy standard of Efficiencyhouse 55 standard for residential buildings and EnEV minus 30% for nonresidential buildings. This requirement is part of the concept tender offer, which is done when selling plots and also applies to the new development areas.</p> <p>Higher standards are rated higher during the evaluation of the offer of an investor who wants to buy a plot, and might be relevant in order to get more scores and potentially the plot.</p> <p>Additionally, aspects like photovoltaic installations and sustainable insulation and construction material are included in the rating as well.</p>		
Status Quo	<p>The minimum standard has been applied at the architecture fair for the new development area "Vogelkamp Neugraben".</p> <p>The concept tender with the higher rating for higher standards and further features was used during the first tenders at "Fischbeker Heidbrook" and will be extended during the next tenders.</p>		
Next Steps	<p>Energy standard and further qualities have to be fixed in the contracts, assured by penalties and controlled by quality assurance activities.</p> <p>This concept procedure has to be used generally for all tenders.</p>		
Key-actors	IBA GmbH in cooperation with Financial Department and Hamburg Ministry for Urban Development and the Environment		
Target group	everybody		
Financing	Business model and lower energy costs for customers, subsidies by Federal Subsidy Bank KfW and local Subsidy Bank IFB		
Publicity, participation	to be discussed		

7.2.7 Reduction of electricity demand in private households (Hamburg Energy Partnerships)

Start of implementation	ongoing	(Planned) Completion	March 2013
Description of the measure	<p>The energy partnerships are a part of the project future concept Renewable Wilhelmsburg and have been realised in cooperation of the house owner association Kirchdorf and students of the HAW University. 40 households were supported and advised in their efforts to reduce their domestic energy and heat demand as well as drinking water. The project provided data and information for the following questions:</p> <ul style="list-style-type: none"> – How high is the energy consumption in households in Hamburg? – Which reduction- and efficiency potentials exist? – Which investments are necessary? – How well informed are the citizens about daily energy saving? <p>The results of the energy partnerships were documented and published. Moreover, the acquired data has been used in another study about how much households can contribute to the climate goals of the city of Hamburg.</p>		
Status Quo			
Next Steps	<p>reactivation of “Energy Partnership” (Energiepartnerschaft)</p> <p>Energy Consultations in cooperation with Consumer Advice Centres (Verbraucherzentrale) and House Owner Associations like Verein Kirchdorfer Eigenheimer – VKE</p>		
Key-actors	Hamburg Ministry for Urban Development and the Environment, HAW University, House Owner Association Kirchdorf (VKE), Vattenfall AB,		
Target group	citizens		
Financing	Business model and lower energy costs for customers, subsidies by Federal Subsidy Bank KfW and local Subsidy Bank IFB		
Publicity, participation	to be discussed		

7.2.8 Installation of new Wind Turbines in the Harbour area

Start of implementation	ongoing	(Planned) Completion	ongoing
Description of the measure	Main source of renewable power is the installation of new wind turbines in the harbour area. Together with the repowering of existing wind turbines, in total six new installations are planned in frame of the Future Concepts Renewable Wilhelmsburg.		
Status Quo	Realized repowering of Wind Turbine on “Energy Hill”		
Next steps	<p>Consultations with Hamburg Energie about already planned new wind turbines</p> <p>Consultations with the Municipal level about potential positions of wind turbines in the harbour area</p>		

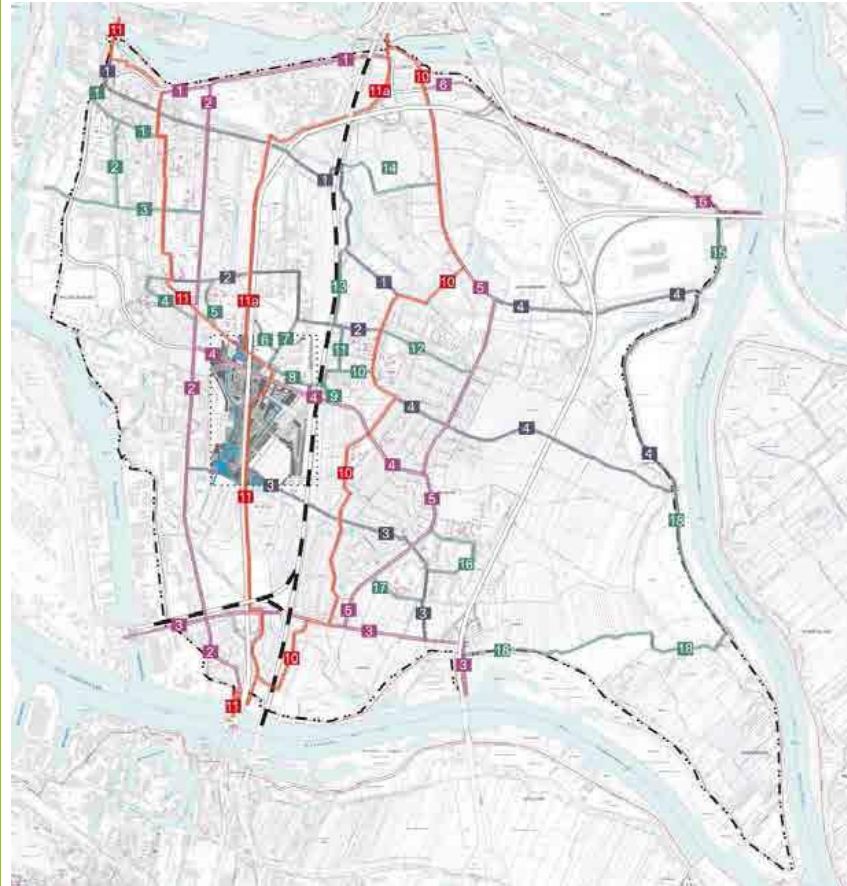
	Consultations with Wind Turbine association about potential positions of wind turbines in the urban area in general
Key-actors	District Hamburg Central, Hamburg Ministry for Urban Development and the Environment, Hamburg Energie GmbH, further investors
Target group	-
Financing	Business model for investors
Publicity, participation	to be discussed

7.3 Mobility

7.3.1 Strengthening of cycling

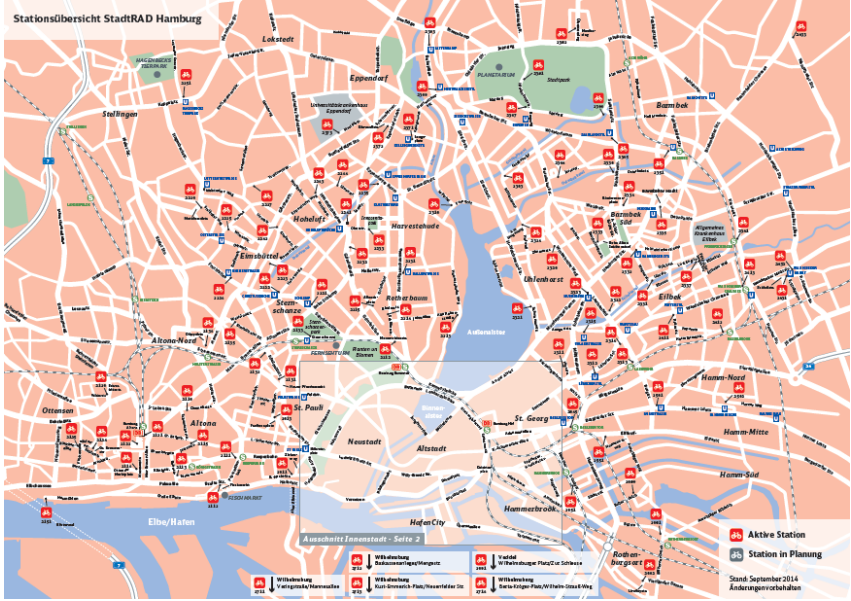
Start of implementation	2009	(Planned) Completion	ongoing
Description of the measure	<p>The Elbe island is predestined for cycling and a lot of activities with focuses on both daily and spare time cycling have been undertaken.</p> <p>A new cycle route (Veloroute 11) through the harbour, which goes through to old Elbe river tunnel, now connects the city centre with the “Reiherstieg” quarter in the north-west of the island. An additional cycling bridge had to be built in order to provide enough safety and establish a continuous cycle path.</p> <p>The cycle paths connections within Wilhelmsburg have been improved by building a few cycling only paths such as the Gert-Schwämmle Weg, which connects the Reiherstieg quarter with the new area in Wilhelmsburg-Central. Furthermore, the first 5km of a new circuit, called “Loop” have been opened in August 2013, which goes through the Island park (Inselpark) along the newly build ministry to the Dockville festival area. It is planned to expand the circuit to up to 30km and to connect the eastern parts of Wilhelmsburg as well.</p> <p>Lastly, in order to promote cycling even more it is demanded by local initiatives to implement service and parking stations at the S-train stations Veddel and Wilhelmsburg.</p>		

Figure 21: Cycling concept for Wilhelmsburg (Plan Netzkonzept Bezirk Hamburg-Mitte)



Status Quo	Wilhelmsburg is the first official cycling model district in Hamburg the district has undertaken a study for the next, midterm and longterm measures which have to be realized
Next Steps	reset the round Table “Fahrradstadt Wilhelmsburg” realize the next steps of the infrastructure plan starting a motivation campaign “Rauf auf’s Rad” for school kids and migrants
Key-actors	Many different actors have been involved in the planning and discussions such as local initiatives (Verein Fahrradstadt Wilhelmsburg), bike associations (ADFC, VCD), the local borough (Hamburg- Mitte), the Port Authority (HPA) and the igs.
Target group	inhabitants
Financing	District Hamburg Central, BWVI, BSU Klimaschutzleitstelle
Publicity, participation	so far: working group “Fahrradstadt Wilhelmsburg” Future: to be discussed – Integration in “Perspektiven! Miteinander planen für die Elbinseln” and „Zukunftsbild Elbinseln 2013+“ process of the Bürgerhaus Wilhelmsburg

7.3.2 Bike Sharing Scheme “StadtRAD”

Start of implementation	July 2009	(Planned) Completion	ongoing
Description of the measure	<p>The StadtRAD bike stations are spread across the city, in particular in areas with many people and at train stations. The aim is to provide an environmentally friendly transport mode, which can easily be combined with other transport modes such as public transport, and to encourage people to cycle.</p> <p>Bikes can be picked up at any station and left at any station. Once registered users can cycle for free within the first 30 minutes. There are different fees per minute depending on whether the user has a monthly public transport, German Rail card or not. However, the fee for a day is limited to 12 Euros.</p> <p>Additionally, there is an App for smartphones, which can be used to see where stations are, how many bikes are left and to rent bikes (maximum two at a time).</p> <p>Similar bike share schemes can be found in other cities in Germany too, however far less successful. But StadtRAD users can also use these schemes and the other way round without additional registration.</p> <p>Figure 22: “StadtRAD” stations</p> 		
Status Quo	<p>131 stations with ca. 1,650 bikes and 268,000 registered users</p> <p>2.3 Mio. Rides since July 2009</p> <p>During high peaks in 2012, each bike was used ca. 7 times a day on average</p>		
Next Steps	<p>Implementation of 40 new bike pick up stations across the city, especially in the area of the district Harburg and Wilhelmsburg</p> <p>500 new rental bikes</p>		
Key-actors	<p>DB Rent GmbH, local boroughs, Hamburg Ministry for Economy, Transport and Innovation</p>		

Target group	Population Hamburg, in particular Harburg and Wilhelmsburg
Financing	City of Hamburg

7.3.3 Extension of Public Transport

Start of implementation	ongoing	(Planned) Completion	ongoing
Description of the measure	<p>There have been measurements in several places on the Elbe Island with different focuses regarding the extension of public transport. One of them is the redesign of the S- train station Wilhelmsburg and the new pedestrian bridge, which connects the shopping area at the Berta-Kröger Square on the one side of the rail tracks with the newly built Wilhelmsburg- Central area with its shops and businesses.</p> <p>Moreover, it is thought of connecting the new underground line U4 in the HafenCity with the S-train line S3, which connects Wilhelmsburg with the city. The extension of the U4 until Wilhelmsburg is also in consideration and will be taken in to account in future planning.</p> <p>In regards to Wilhelmsburg being an island, the local public transport company HVV launched two ferries (73 & 72) which connect the island with both the HafenCity and Landungsbrücken.</p>		
Next Steps	Expansion of the U4 until the Elbe bridge until 2018. Building a new S-train station at the Elbe bridge to be connected to the U4.		
Key-actors	HVV		
Target group	Population of Wilhelmsburg and Hamburg		
Financing			
Publicity, participation	to be discussed – Integration in “Perspektiven! Miteinander planen für die Elbinseln” and „Zukunftsbild Elbinseln 2013+“ process?		

7.3.4 Integration of eMobility in Urban Development – Project “e-Quartier Hamburg”

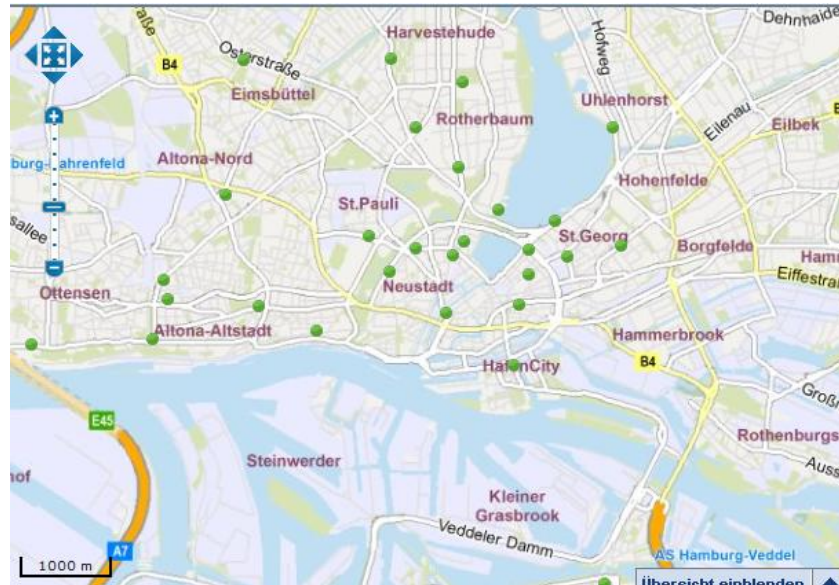
Start of implementation	2011/12	(Planned) Completion	2015 and ongoing
Description of the measure	<p>The project “e-district Hamburg” is part of the exemplary region Electromobility Hamburg and is one objective of the “Masterplan Climate Protection”. A central challenge in coherence with urban development and regeneration is how living and mobility can be combined in the future. It focuses on the integration of e-cars and the connected infrastructure in urban neighbourhoods. The objectives of the project are the following:</p> <p>To push clean and user friendly mobility by increasing e-mobility from renewable energy</p> <p>To push the technical extension and further development of the necessary infrastructure</p>		

	<p>Neighbourhood friendly transport development</p> <p>Insights of future market development of e-mobility in private households</p> <p>The project provides a knowledge platform for the practical application of Electromobility in Urban development. Moreover, different car sharing types are being investigated. In total a network consisting of 120 cars with around 2,000 users should be realised.</p> <p>Several projects and concepts realized:</p> <ul style="list-style-type: none"> – VELUX House – Smart ist Grün – Marina and Binnenhafen Harburg – Several users of eMobility (BSU, HPA, ...)
Status Quo	<p>Integration of several IBA projects in research project</p> <p>First realised car sharing station in major regeneration area Mümmelmannsberg (not part of the IBA area)</p>
Next Steps	<p>Monitoring</p> <p>Integration in new development areas</p> <p>New public charging stations</p>
Key-actors	<p>In total 29 different companies are involved, among others Deutsche Bahn, HafenCity University, hy SOLUTIONS, Vattenfall, aurelis</p>
Target group	<p>citizens</p>
Financing	<p>22.5 Mio. Euros funding from Federal Ministry of Transport and digital infrastructure</p> <p>Funding by national research project</p>
Publicity, participation	<p>to be discussed</p>

7.3.5 Extension of eMobility Infrastructure

Start of implementation	2014	(Planned) Completion	Mid 2016
Description of the measure	<p>With the extension of charging infrastructure, the use of eMobility will be supported and strengthened</p>		
Status Quo	<p>So far, there are around 160 charging points in Hamburg. In IBA area, the only point is located in the Park&Ride parking deck in Veddel.</p>		

Figure 23 Electric car charging stations



Next Steps	<p>Within the “Masterplan Charging Infrastructure”, there are plans to install around 450 more charging points until Mid 2016. 70 of them will be Fast Charging Points.</p> <p>IBA suggested charging points in IBA area at:</p> <ul style="list-style-type: none"> – Train station Wilhelmsburg, – Neuenfelder Straße at BSU Ministry Building or in the frame of nearby development areas – Stübenplatz/Veringstraße/Mannesallee, – Berta-Kröger Platz, – Hospital Groß-Sand.
Key-actors	Hamburg Ministry of Economics and Transport
Target group	citizens
Financing	Funding by Hamburg Senate
Publicity, participation	to be discussed

7.3.6 Extension of Car Sharing Services

Start of implementation	ongoing	(Planned) Completion	ongoing
Description of the measure	With different types of car sharing, the aim is to reduce individual owned private cars and to avoid high numbers of parked cars.		
Status Quo	There are a couple of different car sharing schemes in Hamburg. The only “free floating” concept so far, which can be used in the IBA area, is “Car2go”.		

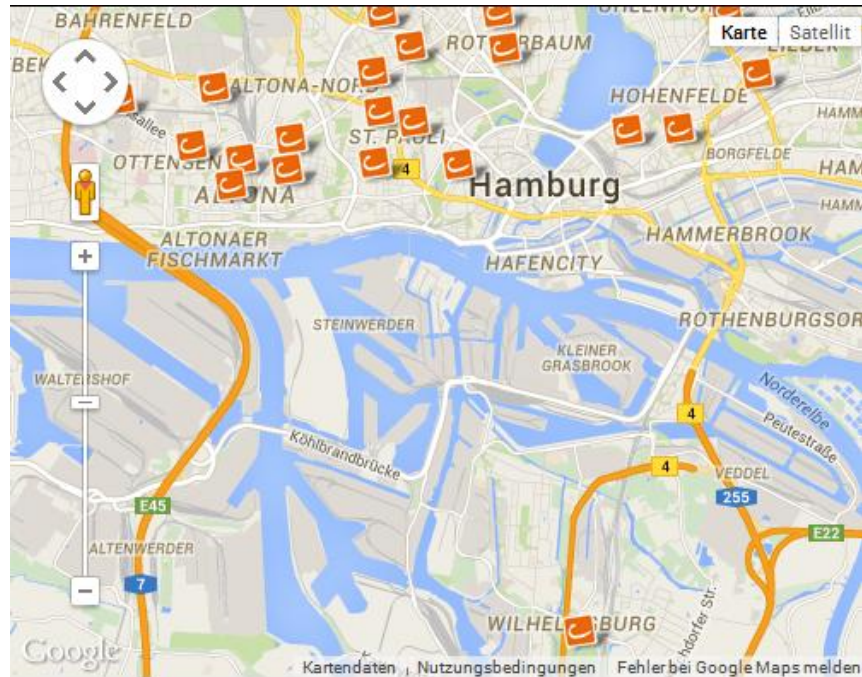
Figure 24: Area of free floating car sharing “car2go”



Other “free floating” provider “Drive Now” is not available in IBA area so far.

Stationary car sharing providers are Cambio at Wilhelmsburg Central with eMobility cars at IBA project “Smart is Green”

Figure 25: Stations of Cambio car sharing



and Greenwheels with two cars at Reiherstieg district at IBA project Open House and at Weimarer Straße.


Figure 26: Stations of Greenwheels car sharing



Next Steps	Extension of “Drive Now” area to Wilhelmsburg Extension of stationary car sharing possibilities
Key-actors	Car sharing providers
Target group	citizens
Financing	Business cases for providers

Publicity, participation	to be discussed
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7.3.7 Intermodal Mobility Points “Switchh”

Start of implementation	2014	(Planned) Completion	ongoing
Description of the measure	To strengthen cycling and public transport and to avoid private cars, intermodal mobility points have been realized to simplify the change between different kinds of mobility possibilities like “StadtRAD”, trains, busses and car sharing.		
Status Quo	So far, there are 7 “Switchh” points at central train stations. Figure 27: “Switchh” Mobility Points		
			
Next Steps	Another “Switchh” point at train station Wilhelmsburg would connect the well-used S-trains as well as different busses, “StadtRAD” and car sharing.		
Key-actors	Hochbahn		
Target group	citizens		
Financing			
Publicity, participation	to be discussed		

7.4 ICT and smart grids

7.4.1 Demand Side Management Research Project “Smart Power Hamburg”

Start of implementation	2011	(Planned) Completion	2014
Description of the measure	<p>The research project “Smart Power Hamburg” deals with how cities and urban district besides increasing their own efficiency can provide energy services for others. Thus, it develops innovative energy efficiency services for the energy forms heat, cold and the fuel gas. The focus is on the best possible integration of renewable energy sources in the supply of cities.</p> <p>The aim of the project is to give recommendations for future urban planning and it serves as an input for the two research programs EnEff: Stadt and EnEff: Wärme. (Hamburg Energie GmbH, 2014)</p>		
Status Quo			
Next Steps			
Key-actors	Hamburg Energie, HAW Hamburg, RWTH Aachen, Hamburg Ministry BSU		
Target group	-		
Financing	Federal Ministry for Economy and Technology Funding by national research project (EnEff: Wärme)		
Publicity, participation	to be discussed		

7.4.2 Storage of renewable power by “Power-to-Heat”

Start of implementation	2011	(Planned) Completion	ongoing
Description of the measure	One possible location of a “Power-to-Heat” unit is the “Energy Bunker”. The technical potentials will be elaborated within the research project “Smart Power Hamburg” and the economic feasibility by Hamburg Energie		
Status Quo	At the moment, the number of connections to the district heating grids is too low to justify the investments in a “Power-to-Heat” unit.		
Next Steps	ongoing elaboration in connection to future extensions of the district heating grids in Wilhelmsburg		
Key-actors	local project: Hamburg Energie, HAW Hamburg, RWTH Aachen, Hamburg Ministry BSU		
Target group	–		
Financing	–		
Publicity, participation	to be discussed		

7.4.3 Storage of renewable power by “Power-to-Gas”

Start of implementation	2013	(Planned) Completion	ongoing
Description of the measure	<p>Several potentials of storage of renewable power are elaborated. One of them is “Power-to-Gas”. Pilot projects are:</p> <p>WindGas Hamburg by E.ON (www.windgas-hamburg.com) with innovation information center in Hamburg-Reitbrook</p> <p>Windgas by Greenpeace (www.greenpeace-energy.de/windgas.html)</p>		
Status Quo			
Next Steps			
Key-actors	e.g. E.ON Hanse, Hydrogenics, Deutsche Zentrum für Luft- und Raumfahrt (DLR), Fraunhofer-Institut für Solare Energiesysteme (ISE). Greenpeace		
Target group	-		
Financing	Funding by national research project		
Publicity, participation	to be discussed		

7.4.4 Hybrid Grids INFRA PLAN Project

Start of implementation	2013	(Planned) Completion	1. Mai 2013 – 30. April 2015
Description of the measure	<p>Through the holistic and in depth analysis across different energy sources, this project aims to describe existing landmark projects in the most innovative German, Austrian and Swiss energy model districts (Berlin Adlershof, GRAZ Mitte and Hamburg Wilhelmsburg) from the vantage point of future smart grid scenarios and developments for urban infrastructure planning. Furthermore, in the context of the transnational knowledge exchange of infrastructure operators, development agencies, R & D demonstration- and implementation projects in the area of hybrid networks will be initiated and prepared. It is planned to expand the existing project consortium with Austrian and Swiss cities, i.e. infrastructure providers.</p> <p>On the basis of existing questions in the energy model districts, the project aims to satisfy the following goals:</p> <p>In depth analysis across different energy sources of existing and planned energy infrastructures in the selected model districts; quantitative modelling and comparison of contrasting (smart grid) investment scenarios</p> <p>Identification and analysis of potential system architectures and preparation of further demonstration projects for the implementation of hybrid networks, with particular attention to hybrid/functional storage solutions</p> <p>Comparative analysis of the respective model districts, as well as taking them into account in energy masterplans, e.g. communal energy concepts</p> <p>Production of strategic recommendations and solutions in the context of conflicting goals between model districts and urban infrastructure planning</p>		

	on the city level
Status Quo	Several project meetings; consultations about future collaborations to organize research projects
Next Steps	Project Meeting in Hamburg Jan 2015
Key-actors	ENERGY RESEARCH AUSTRIA (Coordination), Energie Steiermark AG, IBA Hamburg GmbH, Technische Universität Graz, Technische Universität Wien, WISTA Management GmbH, City of Basel
Financing	Funding by national research project
Publicity, participation	To be discussed

8. Preliminary assessment

In this last chapter the results of the projects and actions taken by the IBA Hamburg are summarised and presented. Additionally, the achieved results are reflected critically, which has been done in the ENERGY ATLAS Work Report 1.

8.1 Results

As mentioned earlier the timeframe for the IBA Hamburg was originally only from 2006 until 2013. Nevertheless, it was decided by the parliament of Hamburg to pursue the IBA to develop some not finished projects and some new ones. Between 2006 and 2013 private investors invested 700 Mio. Euros and approximately 1,200 new housing units were built until 2013. Furthermore, potential plots for another 1,800 housing units were identified in Wilhelmsburg, Veddel and in the Harburg upriver port area to be developed and realised after 2013. During the presentation year 2013 many different events, guided tours and exhibitions were held to present the results of the IBA and the realised projects.

Table 4: IBA Hamburg in Numbers (until 2013)

Construction projects	Infrastructure
1217 new housing units	8 educational facilities, incl. 4 training centres
516 energy-related modernisations	Senior citizen's facilities with an intercultural focus
105,000 m ² office and service industry space	1 student's residence, 4 children's daycare facilities
Open space and green areas	1 indoor swimming pool, 4 sports halls
100 ha international Garden show igs	A centre for artists and creative individuals
71.5 ha parks, harbour areas open to the public	

The results show that the IBA along with the igs are sufficient drivers for an improvement of life quality on the Elbe River island:

- ★ It was achieved to attract considerable private investment.
- ★ Many of the demands and wishes from the future conference in 2002 to improve living conditions on the island by for example opening the Spreehafen, creating a centre for Wilhelmsburg and to increase the quality of educational institutions have only been realised with the IBA and igs.

The deprived south of Hamburg became a place of attention in regards to urban development of the 21. century because of the IBA and igs. The focus on investments in education, local labour markets and culture were seen as the requirement for a sustainable urban development. Nevertheless, some conflicts remain and urge further attendance in a different time horizon.

In the key theme “Metrozones” one of the largest building project was to develop a new urban centre on the Elbe island Wilhelmsburg, called Wilhelmsburg-Central. The 30 hectares comprises a mix of apartments, offices, space for retail and services and recreational functions. This forms the new heart of Wilhelmsburg together with the new Island Park from the igs (International Bauausstellung IBA Hamburg GmbH, 2010). A partly prerequisite for this project is the relocation of the main road (Bundesstraße “Wilhelmsburger Reichstraße”) next to the railway until 2019. In perspective the relocation will open up new possibilities for small businesses and new residential areas because of the release of land. The road will be relocated because it needs refurbishment and estimates say that traffic will increase in the future. Therefore upgrading of roads, operational optimization and traffic management on the Elbe island is needed. A benefit of the relocation is that the noise impact will be decreased due to new noise protection measures along the new road and railway. Furthermore, the existing roads are not sufficient enough to cope with future challenges especially from the harbor. The future development of this potentially released land is subject to what the IBA is working on currently and will be elaborated further below.

In the key theme “Cosmopolis” one of the projects in this context is the “Education Drive” (Bildungsoffensive Elbinseln), which searches not only for new pedagogic and conceptual ways to improve the educational situation on the Elbe Islands, but also there are new trend-setting educational facilities built in the context of the IBA.

Until now, the already realized or already scheduled projects will generate a renewable power production of 54% and a renewable heat production of 14% of the overall demand by 2015.

8.2 Reflections

To assess the success of a project it is important to analyse the results critically and reflect in order to identify weak points. This also helps to find out which projects could be “Best Practices” and could be replicated elsewhere. However, some more reflections are necessary in the future to assess more for the long-term results.

8.2.1 “Failures” and obstacles

Numerous unpredictable factors let individual projects fail and others delay. If the reasons for the two failed projects – the district heating network “New Hamburg terraces” and the “Urban Biogas Project” – are analysed and the time delays of completed projects, five main factors can be named: first, legal or economic reasons, secondly institutional obstacles, thirdly urban-emission problems, fourthly socio-demographic barriers and fifthly changed political conditions.

The legal and economic obstacles are a mismatch between the existing tenancy, taxation and subsidy rights in relation to housing and the intention of the energetic urban regeneration desired by politicians. The decommissioning of not yet amortised heating systems in favor of connecting to a heating grid can result in balance sheet losses and problems of the recalculation of economic rent in public subsidized housing, even if the heat network is operated with renewable energies and thus the climate protection targets are met. In addition the connection to the grid is hindered because it is not allowed, according to the rental law, to have higher heating costs caused through the change of the heat supply, whereat investment costs for individual systems are not considered. The price for the heat from the district heating grid is also in direct comparison with the supply through “the cheapest gas boiler”. These are assumed to be the main reasons for the slow expansion of the district heating grid of the energy bunker.

Mainly the high investment cost of almost 30 million Euros delayed the implementation of the project “Deep geothermal Wilhelmsburg”: Its economic feasibility had to be checked through lengthy investigations and the results are currently evaluated. The institutional difficulties are divergent economic plans of the respective owners or lack of interest in energetic urban regeneration. There is a general skepticism about the supply

through a decentralized network rather than a supply by an individual boiler among some property owners and future consumers.

Of particular importance are the socio-demographic barriers of the energetic urban regeneration, which is reflected in particular in the (too low) rate of retrofitting. This experienced the IBA in the “Top Climate” campaign “(launched in 2009). It required more time and effort to convince residents to participate. It turns out that the willingness and the ability to retrofit the own property in locations such as Wilhelmsburg is negligible. The reason for this is, even though the financially weak situation on the Elbe islands, not primarily due to the costs but because of two aspects: the demography, many property owners are advanced in years, and also because of the fact that retrofitting measurements are rarely the only motive for an investment in the own building. Mostly it is about extensive refurbishments and modernisations so that the total costs for all measures rises and the retrofitting rate decreases.

Retrofitting is often done without the involvement of energy consultants or architects. Single-family homes are often retrofitted by their owners in form of a “DIY retrofitting” and thus without additional financial support. Moreover, the integration of renewable energies such as solar thermal energy is not sufficient despite having many years of experience with the introduced technology. The results of the campaign were more qualitative than quantitative.

Also urban design and emission standards set by the legislative framework may prevent or delay projects, as for example in the case of the “urban biogas project”, which after a long troublesome search found a location in the southeast Wilhelmsburg but finally had to be canceled because the location was on a future road. No alternative location could be found. Overall, one could say that many factors influence district planning e.g. transport planning on a higher level, noise and other emission requirements in the planning act and most importantly residents. Some of these factors are not always manageable in terms of financial resources, labour input and time.

On a national scale Hamburg used to be frontrunner in terms of legally binding climate protection. Hamburg is the only federal state in Germany that has a climate protection law that requires higher energy standards for buildings than the EnEV. However, this law refers to the EnEV 2007 and is therefore outdated. Until now the City of Hamburg has failed at updating this act. The current Masterplan for climate protection rather

focuses on visions rather on concrete measurements or figures to push climate protection in the city.

8.2.2 Social cohesion

How the development of the SUL influences the social cohesion, the inhabitants or their lives will be shown in the coming years. The impact of the development so far on the inhabitants has been described in 1.3. First of all it is difficult to say that the main initiator for this development was the IBA. How can the impact of the IBA be clearly identified? An attempt was made when conducting the annual survey “structural monitoring”. However, urban processes are characterised by many different factors, which are very much interlinked thus it is not always simple to name the cause. Many critics of the IBA were scared that Wilhelmsburg will soon be like St. Pauli or the Schanze district, gentrified districts with high-rocking prices for flats. In the Reiherstieg neighbourhood a few new shops and cafes have opened in the last few years and have increased the local supply not only with daily goods. However, some of them had to already close again because of too few customers and too high rents. According to the press, they have been disappointed from the politicians, who apparently have hyped the district. (Gassdorf, 2014) On the other hand the nationwide first combined Waldoff and ordinary primary school has opened in Wilhelmsburg as a result of many engaged teachers and parents. This is only a small review of the processes in mainly Wilhelmsburg and more will be seen in the future. Nevertheless, these are not directly or even in the slightest been initiated by the IBA. The survey “structural monitoring” has finished in 2013 and will not be conducted in the future. Thus it will be difficult to say how the development in regards to the population and businesses will pursue for the specific areas. Furthermore, the local civil society is dealing critically with this new development in different forms e.g. the Wilhelmsburg History Workshop has an exhibition about how local residents perceive and see the current development.

8.2.3 Project Management

In terms of project and time management one could assume that a few projects have only been realised so quickly because of the statute of an IBA. The strict timeframe demanded a quick planning, decision and implementation of the projects in order to show results in the presentation year in 2013. The IBA was not solely responsible for

planning and building the projects but also to communicate them to the public. Aforementioned great effort was done to show the local, national and international public and press what is being done in the IBA Hamburg. This put a lot of pressure on the realisation of the projects in such a short time. However, this presumably also helped to push the administrative bodies to make fast decisions in order to meet the milestones. Therefore, this experience has shown that setting an exact timeframe with milestones can be very helpful for other projects as well.

8.2.4 “Best Practice”

The high energy efficiency standard of the buildings has been able to be achieved through the so called “Quality Assurance Contract” between the IBA and the investor. A prerequisite for such contracts was that the land was owned by the city of Hamburg thus it was possible for the IBA to make these restrictions. All in all these contracts have shown they are a “Best Practice” and could be used as a tool in other cases as well.

Furthermore, the implementation of the energy network “Wilhelmsburg-Central” was implemented through the Hamburg Climate Protection Act, which makes the connection to a district heating grid mandatory for appointed areas. This has been very helpful.

8.2.5 Limitations

As mentioned in section 6.2.4 the IBA only focused on the building sector of private households, retail and services, which account to 41% of the nationwide energy consumption, in the ENERGY ATLAS. However, the energy demand of transport, industry and life style of the population were left aside in the analysis. These limitations reduce the validity of the results of the ENERGY ATLAS. Contrariwise, this allowed a thorough methodological penetration of the architectural and design aspects, which are often left aside in energetic urban regeneration.

8.2.6 Adjustment

Furthermore, the Island Electricity Survey has shown that the assumptions of the ENERGY ATLAS were correct. But the high fluctuations of the RES result in high



excess electricity and also high deficits when looking at it dynamically. Therefore, local autarky cannot be the aim of a sustainable energy supply but autonomy, which means that the local production of RES is supplemented by load management, storages and the exchange of energy with surrounding districts or the Hamburg region.

8.2.7 A future coordinator

Finally, it has to be emphasized that the efforts undertaken by the IBA so far should not be dropped now. Someone should be responsible in the future, who continues the holistic approach of the Climate Protection Concept Renewable Wilhelmsburg. It is necessary to have someone in charge, who coordinates and pulls the strings for all the different projects and stakeholders. The Free and Hanseatic City of Hamburg has committed itself to the Climate Protection Concept Renewable Wilhelmsburg through the updated Masterplan climate protection. However, the continuation of the Climate Protection Concept requires financial resources, which have not been granted by the responsible ministry (BSU).

IBA Company as development agency will integrate the implementation of the Climate Protection Concept Renewable Wilhelmsburg in the general work as much as possible.



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