

018530 - SWITCH

Sustainable Water Management in the City of the Future

Integrated Project
Global Change and Ecosystems

(Hamburg part of)
Deliverable 1.1.6
Report on City Strategies.

Due date of deliverable: M60
Actual submission date:

Start date of project: 1 February 2006 Duration: 60 months

Organisation name of lead contractor for this deliverable:
HafenCity Universität, Hamburg

[Final version]

Project co-funded by the European Commission within the Sixth Framework Programme (2006-2011)		
Dissemination Level		
PU	Public	x
PP	Restricted to other programme participants (including Commission Services)	
RE	Restricted to a group specified by the consortium (including Commission Services)	
CO	Confidential only for members of the consortium (including Commission Services)	

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A. Achievements of SWITCH Regarding Integrated Urban Water Management in Hamburg Wilhelmsburg

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On basis of work from Heike Langenbach, Jochen Eckart, Gerko Schröder (2/2006-7/2009)

After a 5 years program, the SWITCH project is coming to an end. This paper presents the main results of the SWITCH learning alliance approach in the city of Hamburg and identifies lessons learned and recommendations that are intended to support appropriate follow-up of the project in the city.

This paper outlines how the SWITCH methodology of the learning alliance was implemented and the outcomes of that process. In addition to this the paper presents an insight of the thematic discussions and findings of the learning alliance. The paper closes in showing a strategic direction for an integrated urban water management and presents further steps that need to be undertaken to ensure consistency of the local work on water related issues.

The overall goal of SWITCH was specified for Hamburg in the year 2006 by the two main parties HafenCity University and the municipality of Hamburg. Hamburg wants to support sustainable and innovative solutions for urban water management in districts going through urban transformation processes. There are a number of critical issues, which urgently need solutions, regarding the environmental quality of the water system as well as progressive risks and water problems related to global environmental change. This is considered to require an innovative water management approach that is able to combine new water management techniques and modern urban planning and also at the same time improve cross linkages with other organisations in order to achieve financial savings and have more multi-use sites.

Hamburg is a city where water is abundant. This causes a number of challenges regarding water management:

- Flood risks along the Elbe river and the North Sea
- Flash flooding caused by storm-water runoff
- Diffuse pollution of surface waters by industries, agriculture and storm water
- High/ rising groundwater tables caused by a reduction in groundwater extraction
- Limited capacity of the existing sewerage system
- Making best use of water as an element to develop attractive locations that facilitate a high quality of housing, increase the quality of life and attract new inhabitants
- Water management in districts, which are experiencing development, and hence changing land use by adaptation of the existing infrastructure

The island of Wilhelmsburg, as the main area of the future urban development, is characterised by the combination of 'technical' water management problems (flood risks, storm water management etc.) and 'urban planning' demands (water as an element to develop attractive locations etc.). Regarding these problems the learning alliance Hamburg decided to focus the SWITCH activities on the river island of Wilhelmsburg.

Summary

The city of Hamburg has an increasing population and is one of the fastest growing cities in Germany. The expected population growth and the expanding harbour evoke a predictable need for urban development. The urban development mainly takes place in the south of the city, in particular on the river island of Wilhelmsburg. Wilhelmsburg, which was neglected for many years, is now in the centre of attention of the urban planning of the municipality of Hamburg. In the second half of the 1990s, Hamburg gradually began to discover the attractive potential of its waterfronts. The “Leap across the Elbe” from the inner city via the quarter “Hafen City”, the Grasbrook, the Veddel and Wilhelmsburg towards the community of Harburg on the southern side of the Elbe river, is the core of the city's vision. City renewal / rehabilitation of sites is the centre of this approach to address both emigration and immigration patterns in a socially stabilizing way. The City Senate vision of 'Hamburg Metropole – a growing city' aiming for a sustained enhancement of Wilhelmsburg and city expansion towards the south.

Wilhelmsburg is a quarter within the city district of Hamburg-Mitte. The Elbe Island is 13 kilometres in diameter and has an area of 35 square kilometres. According to the area it is the biggest quarter of the 104 quarters belonging to Hamburg. Furthermore it accommodates the sixth largest population figure of Hamburg's quarters. In the end of the year 2009, Wilhelmsburg counted approximately 50.000 inhabitants.

Because of its position in a flourishing harbour district, Wilhelmsburg had developed from a rural community into an important industrial and residential district by the end of the 19th century. The result was a patchwork of different land uses, including port areas, one-family houses, Wilhelminian neighbourhoods, satellite cities, roads, agricultural land, allotments and nature conservation areas. After the flood disaster of 1962 the economic and social situation of Wilhelmsburg declined due to a lack of maintenance of its building stock and structural changes in the harbour, etc. Today, as a result of this, Wilhelmsburg is a socially disadvantaged neighbourhood, with low income levels, high unemployment, a high ratio of social security benefit recipients, a large migrant population and a slight level of education (e.g. small rate of students with a higher education entrance level).

The climate is orientated on the Atlantic climate which is influenced by its proximity to coastal areas, the sea as well as from the nearby wetlands. Snowfall is rare, generally occurring once or twice a year. The average annual temperature is 9.0 °C (48.2 °F), the average temperature range is 18,5 °C. The warmest months in Hamburg are June, July, and August, with high temperatures of 19.9 to 22.2 °C (68 to 72 °F). The coldest are December, January, and February, with low temperatures of -1.4 to 0 °C (29 to 32 °F).

The basic figures of the local water balance are an annual rainfall of 780mm, an evaporation of 490mm, a renewal rate for ground water of 25mm and a surface discharge of 265mm. From September to March the climatically water balance is positive (rainfall is higher than evaporation), from April to August the balance is negative. The climatically water balance has a surplus of 290mm/year. Because of the soil with a very low permeability to water there is only an infiltration of 25mm/year. Hence 35% of the storm water is drained on the surface. This balance clearly shows that the most rainfall has to be diverted by the drainage system. The worldwide climate change will have impacts on the local water balance. Especially the number of extreme events (strong gales) increases. In combination with the expected rise of the sea level the danger of storm tides caused by the North Sea and the river Elbe will increase.

Numerous stakeholders are involved in spatial planning and water resource management on the Elbe Island Wilhelmsburg. The responsibilities for spatial and water resource planning are divided between the Free and Hanseatic City of Hamburg, the Department of Urban Development and Environment (BSU) and the District Authority Hamburg Mitte (Bezirksamt Hamburg Mitte). Related institutions are the State Office for Roads, Bridges and Waterways (Landesbetrieb Straßen Brücken und Gewässer), Hamburg Water (Hamburg Wasser), Hamburg Port Authority (HPA), various water and soil organisations, the IBA GmbH Wilhelmsburg and IGS GmbH, the Hamburg Chamber of Commerce, etc. There are also numerous activities by civil society stakeholders with the objective of promoting a social, economic and cultural neighbourhood.

A series of workshops was conducted to discuss how an integrated urban water management for Wilhelmsburg in the year 2030 should look like. A common vision *'Make water visible and useful'* was formulated to describe the type of urban water management on the island of Wilhelmsburg in the year 2030.

It was agreed to discuss how the vision could be achieved by focusing on two specific water related issues.

1. water regulation system on the island of Wilhelmsburg
2. recreation and conservation on the island of Wilhelmsburg

Water Regulation System: The water regulation system is highly complex and consists of pumps, tidal gates and a number of weirs to regulate the water level of ditches and even single sections of ditches. Suggestions were made how water level should be changed in exemplary sections of ditches. The discussion focussed on how different demands towards different water levels could be encountered. In addition to this, proposals were developed to improve the present management of water bodies.

Recreation and Conservation: It appeared that inhabitants use water bodies and their embankments for a number of different recreational activities. Rowing, taking a walk, swimming and having a barbecue are some of these activities. The analysis revealed a high recreational demand and high ecologic values of the water bodies themselves and the adjacent areas. During the process of developing strategic directions for this topic, it was also discussed if regulations for recreational activities should be implemented to ensure the ecologic value and quality of the water bodies.

The following strategic directions were identified as to be addressed to improve an integrated approach of an urban water management: new paths of communication need to be identified and should be used more effectively. Further investigations need to be undertaken to clarify the influence of water causing problems in developed areas. Measurements to enforce specific recreational activities where wanted and to provide areas for conservation where needed must be developed. Conduct training and provide information that is used for education especially in schools and associations. The function of drainage and irrigation through water bodies in Wilhelmsburg needs to be considered carefully and is of superior importance. Develop pilot projects to create examples for best management practices. An ongoing facilitation and discussion of water related issues is needed.

Based on these findings future actions were determined to ensure that initiatives endure even though the SWITCH project has come to an end.

B. Changing World

1) Current situation and future projections

a) Water balance – now and under scenarios

A rough local water balance of the river island of Wilhelmsburg is documented in the 'Regional Water Management Concept Wilhelmsburg' (FHH 1998). The basic figures are an annual rainfall of 780mm, an evaporation of 490mm, a renewal rate for ground water of 25mm and a surface discharge of 265mm. From September to March the climatically water balance is positive (rainfall is higher than evaporation), from April to August the balance is negative. The climatically water balance has a surplus of 290mm/year. Because of the soil with a very low permeability to water there is only an infiltration of 25mm/year. Hence 35% of the storm water is drained on the surface. This balance clearly shows that the most rainfall has to be diverted by the drainage system.

The worldwide climate change (IPCC 2007) will have impacts on the local water balance.

Base on current regional model calculations forecasts for the year 2100 are produced (Umwelt Bundesamt 2006, Umwelt Bundesamt 2007). For Hamburg an average warming between 1,8 and 3,5° C is expected. According future forecasts for northern Germany the average temperature in the next decades (2011 - 2040) will increase between 0,5°C min. and 1,1°C max. and until the year 2100 between 2°C min. and 4,7° max. in comparison to the period 1961-1990 (Norddeutsches Klimabüro 2010).

For the average amount of precipitation several scenarios are discussed. One scenario forecasts no significant changes of the average rainfall. The research forecast for northern Germany presents a range between 1% and 15% increasing rainfall (Norddeutsches Klimabüro 2010). And another scenario predicts a reduction of the amount of precipitation in the summer (less 20%) and no changes in the winter. The last scenario forecasts a shift of the average amount of precipitation from summer to winter. During summer there is the danger of low water levels in the river Elbe with negative impacts on the water quality. Also an increasing number of extreme rain events is expected. In consequence the danger of fluvial flooding in Hamburg will increase.

The average wind velocity in Hamburg declines, but the number of extreme events (strong gales) increases. In combination with the expected rise of the sea level the danger of storm tides caused by the North Sea and the river Elbe will increase.

b) Population

Wilhelmsburg has approximately 50,000 inhabitants and is located in the geographical centre of Hamburg. The Elbe Island is 13 kilometres in diameter and has an area of 35 square kilometres;

Table 1: Social Figures of Hamburg Wilhelmsburg (Statistikamt Nord 2010a)

Hamburg district 'Hamburg Mitte' sub-district 'Wilhelmsburg'	
Area in km ² :	Sub-district 35.3km ²
Population	Sub-district 50,250
Density (inhabitants per km ²):	1,419

c) Climate

Table 2 Basic Figures of Climatic Conditions (Deutscher Wetterdienst 2010)

Climate	Temperature	9.0°C average
	Climatic zone	Temperated climate, Atlantic climate
	Annual rainfall	774mm

Hamburg has an Atlantic climate which is influenced by its proximity to coastal areas, the sea as well as from the nearby wetlands. Snowfall is rare, generally occurring once or twice a year.

The average annual temperature is 9.0 °C (48.2 °F), the average temperature range is 18,5 °C. The warmest months in Hamburg are June, July, and August, with high temperatures of 19.9 to 22.2 °C (68 to 72 °F). The coldest are December, January, and February, with low temperatures of -1.4 to 0 °C (29 to 32 °F).

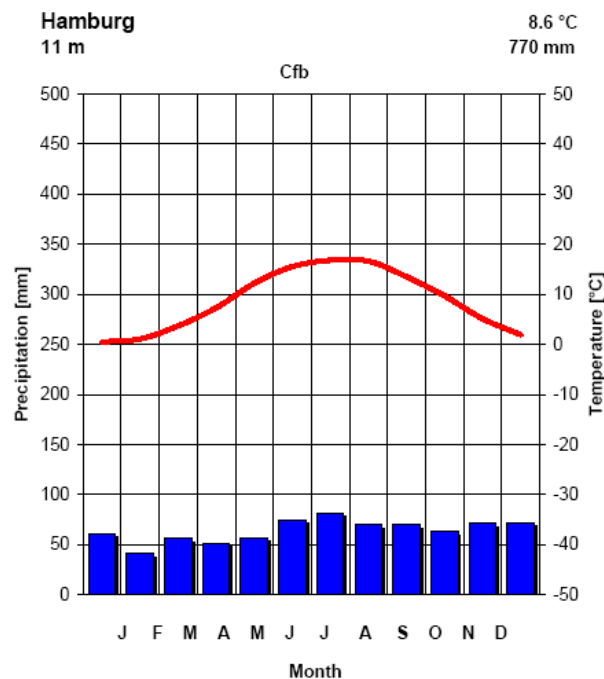


Figure 1. Climate Diagram of Hamburg (HCU, Deutscher Wetterdienst 2010)

The average annual rainfall is 774mm. The relative humidity is in average 80.7% and monthly ranges from 71% in May to 91% in December.

According future forecasts for northern Germany, the climate could change already in the following decades.

Comparing with the periods 1961-1990 the average temperature will increase in 2011-2040 between 0,5°C min. and 1,1°C max. and until the year 2100 between 2°C min. and 4,7° max.. The rainfall will increase between 1% and 13% in the annual average but could rise up to 58% in wintertime. As a consequence the snowfall in Hamburg will decline dramatically in the end of the 21st century (Norddeutsches Klimabüro 2010).

Table 3: Monthly Data of Temperature and Precipitation (Deutscher Wetterdienst 2010)

Month	Mean Temperature °C		Mean Total Rainfall (mm)	Mean Number of Rain Days
	Daily Minimum	Daily Maximum		
Jan	-1.4	3.5	64.4	12.1
Feb	-1.2	4.4	42.4	9.2
Mar	1.1	8.0	62.9	11.3
Apr	3.3	12.3	45.6	8.9
May	7.4	17.5	53.7	9.6
Jun	10.5	19.9	76.9	11.3
Jul	12.7	22.1	74.7	11.4
Aug	12.5	22.2	73.0	10.2
Sep	9.6	17.9	68.4	10.8
Oct	6.0	13.0	63.6	10.5
Nov	2.4	7.5	69.4	11.7
Dec	0.0	4.6	77.7	12.4

d) Institutional

Numerous stakeholders are involved in spatial planning and water resource management on the Elbe Island Wilhelmsburg. The responsibilities for spatial and water resource planning are divided between the Free and Hanseatic City of Hamburg, the Department of Urban Development and Environment (BSU) and the District Authority Hamburg Mitte (Bezirksamt Hamburg Mitte). Related institutions are the State Office for Roads, Bridges and Waterways (Landesbetrieb Straßen Brücken und Gewässer), Hamburg Water (Hamburg Wasser), Hamburg Port Authority (HPA), various water and soil organisations, the IBA GmbH Wilhelmsburg and IGS GmbH, the Hamburg Chamber of Commerce, etc. There are also numerous activities by civil society stakeholders with the objective of promoting a social, economic and cultural neighbourhood. Related stakeholders are the Wilhelmsburg Advisory Commission (Beirat Wilhelmsburg), the Association for the Future of the Elbe Island Wilhelmsburg (Verein Zukunft Elbinsel Wilhelmsburg), the Citizens' Association Wilhelmsburg (Bürgerverein Wilhelmsburg), the Association for Nature and Environmental Protection Regional Office Hamburg (BUND Landesverband Hamburg), the Hamburg Foundation for Nature Protection (Stiftung Naturschutz Hamburg) and Foundation Loki (Stiftung Loki), the Botanical Association Hamburg (Botanischer Verein zu Hamburg), the Society for Ecological Planning (Gesellschaft für Ökologische Planung) and the Council for the Future of Hamburg (Zukunftsrat Hamburg).

In the quarter of Wilhelmsburg several persons and organisations are involved in urban and landscape planning and water management.

Behörde für Stadtentwicklung und Umwelt Hamburg (State Ministry of Urban Development and Environment Hamburg (BSU))

Concerning water management and urban planning various departments of the BSU have got diverse responsibilities. The most important departments and sections in relation to water management are BSU – U as 'Department of Environmental Protection' BSU – IB as 'Department of Immission Control and Enterprises' and BSU - LP as 'Department of Land

Use and Landscape Planning'. For details compare the general description in the case study of the municipality of Hamburg.

City district authority Hamburg-Wilhelmsburg

The area of the municipality of Hamburg is subdivided into seven city districts Altona, Bergedorf, Eimsbüttel, Hamburg Mitte, Hamburg-Nord, Harburg, Wandsbek which each having their own authority. Due to a reorganisation of the municipality of Hamburg the quarter Wilhelmsburg changed from the district 'Harburg' to 'Hamburg-Mitte' at the beginning of the year 2008. The city district authorities are responsible for the work that should be dealt with locally. The departments of urban planning and civil engineering deal with the matters of water management on local level. So far the city districts work under direction of the BSU meaning that they have restricted powers and independence. Superordinated planning issues and matters of permissions are in the responsibility of the BSU where as the departments of each single city district have to deal with the local implementation regarding the existing guidelines (planning and water acts, construction, development). The surface waters on the river island of Wilhelmsburg, in particular the area south of the railway line and north of the oxbow lake 'Dove Elbe', are managed and maintained from the district authority.

Landesbetrieb Straßen, Brücken und Gewässer (Provider for Streets, Bridges and Waters)

Because of the reorganisation of the municipality of Hamburg the 'Landesbetrieb Straßen, Brücken und Gewässer' has taken over the functions of the former department 'Betrieb' of the BSU. The 'Landesbetrieb' is involved in all water related demands of the other planning departments (e.g. the urban planning activities of IBA and 'Leap Across the Elbe'). For details compare the general description in the case study of the municipality of Hamburg.

Hamburg Wasser (Hamburg Water Inc.)

Beside the everyday management of the water supply and sewage system there are some special activities of 'Hamburg Wasser' on the river island of Wilhelmsburg. So 'Hamburg Wasser' is involved in different projects of the IBA. Within the scope of the IBA project 'Haulander Weg' a demonstration project for eco-sanitation is planned. A decentralised treatment of waste water will be combined with the production of renewable energies (biogas) out of sewage. Another project is heat-recovery out of sewage.

Hamburg Port Authority (HPA)

'Hamburg Port Authority' is responsible for certain areas of the harbour of Hamburg, the national water ways and attached water bodies (FHH 2006). The West of Wilhelmsburg is part of this area. 'Hamburg Port Authority' is responsible for the whole spatial planning concerning all demands. The 'Hamburg Port Authority' (HPA) has two functions on the river island of Wilhelmsburg:

On the one hand HPA is responsible for the spatial planning in the harbour area (e.g. the area along the Reiherstieg). The HPA does not support the suggestion of the urban planning workshop in the year 2003 to develop an attractive area for living and working at the Reiherstieg. On the contrary the HPA favoured the present harbour use, so that the urban planning activities are limited.

On the other hand HPA is developing an integrated concept for the sustainable development of the river Elbe.

Water boards

Water boards are built up voluntarily as a private pooling of municipality tasks at the state's instance. Water boards can take over responsibilities regarding waste water treatment, storm water management and the maintenance of water bodies (Bundesumweltamt (ed.) 2006). On the river island of Wilhelmsburg following water boards exist:

The water board 'Wilhelmsburg East' is responsible for the management and maintenance of the drainage and irrigation system east of the railway line and south of the oxbow lake 'Dove Elbe' and manages the water inlet from the river Elbe. The water board is part of the SWITCH learning alliance. The water board 'Wassergenossenschaft des Schmidtkanals auf Wilhelmsburg' is responsible for the canal 'Schmidtkanal'. The canal is located in a commercial site and not interesting for the further urban and landscape development of Wilhelmsburg. The water board 'Sielverband Moorwerder' is responsible for the former island 'Moorwerder' which is located in the very east of Wilhelmsburg. In this rural site there are no urban and landscape planning activities so that the water board is from minor importance.

Internationale Bauausstellung Hamburg GmbH und Internationale Gartenbauausstellung Hamburg GmbH (International Building Exhibition Hamburg Inc. and International Horticultural Exhibition Hamburg Inc.)

In the year 2006 the IBA Inc. was founded. There is a close cooperation between the IBA Inc. and the 'State Ministry of Urban Development'. Task of the company is to implement the 'International Building Exhibition' in the year 2013. Based in the key concept 'Leap Across the Elbe' the IBA develops concepts for the future of the metropolis. The 'International Building Exhibition Hamburg Inc.' (IBA) is responsible for the implementation of the exhibition. The exhibition area is the island of Wilhelmsburg, the adjacent island of 'Veddel' and the 'Inland Port Harburg'. The responsibility is focused on IBA-projects and does not include the whole island of Wilhelmsburg. The internal reach of competences is divided in different projects (Weltquartier, Spreehafen, Kirchdorf Nord etc.) as well as thematic priorities (cultural programme, education/ knowledge and town in climate change). (interview Mr. Wessel 22.08.2007) The 'International Horticultural Exhibition Hamburg Inc.' (IGS) is focused on the structural implementation of the exhibition. The responsibility is limited on the exhibition area. Both companies are closely related to each other on organisational level. A close coordination of both exhibitions is ensured.

Handelskammer Hamburg (Chamber of Commerce Hamburg) / Der Wirtschaftsverein für den Hamburger Süden e.V. (The economy club for the south of Hamburg)

The 'Chamber of Commerce Hamburg' is a council for the self-administration of the economy. The chamber of commerce is a service provider for the companies as well as an organisation of the economy for the self-management of public functions. The function is already described in the case study of the city of Hamburg.

The economy club represent more than 170 companies in the south of the metropolitan region of Hamburg. Sphere of influence is also the river island of Wilhelmsburg. The club represents the interest of the members and is an important stakeholder to influence politics and administration. Aim is the advancement of the economical objectives of the members.

The 'Chamber of Commerce Hamburg' is responsible for whole the city. The economy club is focused on the south of Hamburg. Both associations have developed a common concept for the urban development in Wilhelmsburg. (interview Mr. Siebrand 16.08.2007 and interview Mrs. Tillmanns 16.07.2007):

Siedlungs-Aktiengesellschaft Altona (Housing Corporation Altona (SAGA))

The SAGA is the public sector housing corporation of the municipality of Hamburg. The corporation is owned by the municipality of Hamburg. In the year 2007 the corporation owns 135.000 flats and is the biggest housing association of Hamburg. The corporation is actively

involved in urban planning. In the last years the 'SAGA agency Wilhelmsburg' had implemented several urban redevelopment projects on the river island of Wilhelmsburg. The agency supported the management of quarters with social conflicts. Different problems and potentials for the water management on the river island of Wilhelmsburg were affected (interview Mr. Loose 23.07.2007). Since the year 2008 the head of the local SAGA agency is the head of the water board for the east of Wilhelmsburg. The SAGA is one of the biggest land owners in the water board and is interested in an efficient water management.

Beirat Wilhelmsburg (Advisor Council Wilhelmsburg)

By order of the municipality of Hamburg an active stakeholder and citizen's engagement is carried out on the river island of Wilhelmsburg since the year 1994. Goal is the valorisation of the quarter Wilhelmsburg. Since the year 1996 an advisor council was established which consist of inhabitants. The advisor council advised the local politics and serves as connection between inhabitants, politics and authority. The council is concerned with all question of the urban redevelopment of Wilhelmsburg. The advisor council develops urban design measures, together with the inhabitants. The council develops structural measures for the improvement of urban design and has a small budget for the implementation of measures. In the most time the projects are small and unimpressive but correspond to the local requirements and have a high acceptance. In contrast the big and visionary projects of the IBA are often developed from non-local planers. The advisor council is engaged with all problems of the urban development of the quarter Wilhelmsburg. Water management is only a partial aspect. At the end of 2007, the committee was terminated. In the opinion of the municipality of Hamburg several other committees for citizens' engagement had emerged so that the advisor council had become superfluous. (interview Mr. Usadel 15.06.2006 and interview Mrs. Schubert 30.07.2007)

Verein für Heimatkunde in Wilhelmsburg e.V. gegr. 1907 (Society of Local History in Wilhelmsburg)

The society is concerned with the local history of the river island of Wilhelmsburg. Many original inhabitants of Wilhelmsburg are member of this society. An important activity of the society is the publishing of the local newspaper 'Die Insel'. The 'Local History Club' offers boat trips on the river island of Wilhelmsburg. Hence the club is interested in the improvement of the canals. So the enlargement of the 'Assmannkanal' is favoured. Also additional landing stages at the locations 'Dove-Elbe', 'Ernst-August-Schleuse' or 'Reiherstieg' are requested. (interview Mrs. Falke 06.08.2007)

Verein Zukunft Elbinsel Wilhelmsburg e.V. (Society for the Duture of the River Island of Wilhelmsburg)

The society arose from the 'Future Conference Wilhelmsburg' which takes place in the year 2001 and 2002. The society feel obliged to the results of the future conference and wants to continue the established cooperation between inhabitants, economy, administration and local politician. Objective is to facilitate the improvement of the river island of Wilhelmsburg. Measures for education, youth work, culture, art, nature conservation, understanding among different nations etc. are implemented. On a monthly public meeting the present urban developments are discussed. The society represents a wide range of different inhabitants in particular the educated and progressive middle class. (interview Mr. Humburg et. al 03.08.2007)

Bürgerverein Wilhelmsburg e.V. (Citizen Club Wilhelmsburg)

The association arose from the protest against the dike relocation at the beginning of the 21st century. Goal is to improve the image of the river island of Wilhelmsburg. The association favours all activities which have a positive influence for the image of the river island.

BUND Landesverband Hamburg e.V. (Union for Environmental Protection and Conservation Hamburg)

The 'BUND Landesverband Hamburg' was founded in the year 1981 and is part of the nationwide 'Union for Environmental Protection and Conservation'. The association is authorised by the §29 of the 'Federal Nature Conservation Act' (BNatSchG) and has special rights in spatial planning processes. The association is involved in several themes of environmental protection and nature conservation in Hamburg. Because the chairman of the association is living at the river island of Wilhelmsburg the association is involved in several projects. So the association maintains different nature protection projects on the island. Furthermore there is a long-lasting conflict between the BUND and the 'Water board for the East of Wilhelmsburg' about the height of the water levels in the drainage ditches.

Stiftung Naturschutz Hamburg und Stiftung Loki Schmidt (Foundation Environmental Protection Hamburg and Foundation Loki Schmidt)

The Foundation Environmental Protection Hamburg and Foundation Loki Schmidt arose in the year 1985 by the fusion of the two former foundations. Objective is the development of measures for the protection, maintenance and development of nature. A thematic priority is the purchasing of endangered biotopes and the training of volunteers for maintenance. On the river island of Wilhelmsburg the foundation has leasehold several areas, in particular wet meadows in east of the island. (interview Mr. Martens and Mr. Köpke 25.06.2007)

Botanischer Verein zu Hamburg e.V. (Botanic Society Hamburg)

The 'Botanic Society Hamburg' was already founded in the year 1891. The association is authorised by the §29 BNatSchG. Objective of the association is the protection of plants and animals and their habitats to develop the variety, character and beauty of nature.

GÖP Gesellschaft für Ökologische Planung e.V. (Society for ecological planning)

The association GÖP was founded in the year 1983 and is authorised by the §29 BNatSchG. GÖP is focused on the maintenance of nature conservation areas and the development of biotopes. An overall project is to develop and conserve the wetlands of the river Elbe around Hamburg. GÖP manages the information centre 'Bunthäuser Spitze' on the river island of Wilhelmsburg.

All nature conservation associations of Hamburg are working on the river island of Wilhelmsburg. The nature conservation associations maintain and develop biotopes. Furthermore the development of the nature outside of protected areas is observed and accompanied critically (recommendations, action in law etc.). All nature conservation associations pooled their strengths and developed a common concept for the development of the river island of Wilhelmsburg (cp. concept 'Unser grünes Wilhelmsburg'). In the concept the present conditions of nature are ascertained and a concept for the development of nature is developed. Thematic priority is the revaluation of the historical cultural landscape. (interview Mr. Martens and Mr. Köpke 25.06.2007)

Zukunftsrat Hamburg (Future Council Hamburg)

The 'Future Council Hamburg' (not to be confused with the world future council) was founded in the year 1996. The council refers to the conference of Rio de Janeiro and the agenda 21. The 'Future Council Hamburg' is a pooling of associations, institutions and companies which contribute to the sustainable development of Hamburg.

The council had developed indicators for the sustainable development of Hamburg (Zukunftsrat Hamburg 2006). Based on a tried and tested collection of aims, indicators and target values of sustainability the urban development of Hamburg is analysed periodically. (interview Mr. Menzel 15.03.2007)

e) Social situation

Because of its position in a flourishing harbour district, Wilhelmsburg had developed from a rural community into an important industrial and residential district by the end of the 19th century. The result was a patchwork of different land uses, including port areas, one-family houses, Wilhelminian neighbourhoods, satellite cities, roads, agricultural land, allotments and nature conservation areas. After the flood disaster of 1962 the economic and social situation of Wilhelmsburg declined due to a lack of maintenance of its building stock and structural changes in the harbour, etc. Today, as a result of this, Wilhelmsburg is a socially disadvantaged neighbourhood, with low income levels, high unemployment, a high ratio of social security benefit recipients and a large migrant population.



Figure 2. A considerable Part of Wilhelmsburg is Hosting Sections of the Harbour (photos: K.M. Dietrich)

f) Socio-economic development

Wilhelmsburg is a quarter within the city district of Harburg. According to the area it is the biggest quarter of the 104 quarters belonging to Hamburg. Furthermore it accommodates the sixth largest population figure of Hamburg's quarters. In the year 2004, Wilhelmsburg counted 48.322 inhabitants. Wilhelmsburg is a socially deprived quarter, with a low level of income, a high rate of unemployment and of welfare recipients (compared with the other quarters of the municipality of Hamburg). Wilhelmsburg has a young population. The percentage of children and youth is above the citywide average. In contrast, the percentage of elderly people is lower. But there is a slight level of education (e.g. small rate of students with a higher education entrance level). A good 34% of the island's population is of foreign origin. Because of the great number of foreign persons a diverse multicultural society emerges. But there are also many unsolved social and cultural conflicts. (Zukunftskonferenz

Wilhelmsburg 2002) Table below gives its characteristics in comparison with Hamburg municipality as a whole.

Table 4: Social and Economical Basic Conditions of the River Island of Wilhelmsburg (Statistikamt Nord 2010b)

	Sub-District Wilhelmsburg	Hamburg
Population (2009)		
Population	50 250	1 733 260
Younger than 18 years	10 885	270 561
% population	21.6	15,6
Older than 65 years	7 113	331 877
% population	14,2	19,1
German	33 365	1 497 342
Foreign	16 885	235 918
% population	33.6	13.6
Surface in km ²	35.3	755,2
Population density / km ²	1 419	2 295
Social structure		
Formal employed	14 356	594 454
Of which women	5 779	286 600
Of which men	8 577	307 854
Jobless	3 961	53 994
Jobless youth	218	7 722
% 15-25 age	5.8	3,7
Jobless elder people	305	9 021
% 55-65 age	7.7	4,2
On social security pay	12 775	197 590
% population	25.5	11.4
Housing		
Average housing size in m ²	67,7	72,3
Per inhabitant in m ²	28,1	37,1
Social housing	6 487	98 470
% of total	31.2	11.1
Infrastructure		
School going	5 543	167 548
Secondary schools	6	192
Traffic		
Cars / 1000 inhabitants (2008)	277	410
Crime		
Total	6 698	236 824
Per 1000 inhabitants	134	137
STATISTIKAMT NORD 2010		

In the past, the Elbe delta area housed the harbour of Hamburg and harbour-related industries. The abandonment of the old docking area and the closure or departure of the old industries initially led to the economic and social decline of the area, with negative impacts

on the original local population and the low-income immigrants that had settled there. In the 1980s, under the new urban policy, urban rehabilitation aimed for improved living quality in various parts of the island. Still many long-time inhabitants left the district. At the same time there was an influx of lower income groups, in particular of foreign “Gastarbeiter”. Increasing social disturbances in the eighties and early nineties led to the adoption of a citizens’ participation policy for urban development. The citizen’s participation mechanism “MITwirken in Wilhelmsburg” is part of the larger Hamburg municipal urban development programme. This programme promotes the improvement of livelihoods in parts of the city with particular needs.

The city of Hamburg has an increasing population and is one of the fastest growing cities in Germany. The expected population growth and the expanding harbour evoke a predictable need for urban development. The urban development mainly takes place in the south of the city, in particular on the river island of Wilhelmsburg. Wilhelmsburg, which was neglected for many years, is now in the centre of attention of the urban planning of the municipality of Hamburg. In the second half of the 1990s, Hamburg gradually began to discover the attractive potential of its waterfronts. The “Leap across the Elbe” from the inner city via the quarter “Hafen City”, the Grasbrook, the Veddel and Wilhelmsburg towards the community of Harburg on the southern side of the Elbe river, is the core of the city’s vision. City renewal / rehabilitation sites at the centre of this approach to address both emigration and immigration patterns in a socially stabilizing way. The City Senate vision of ‘Hamburg Metropole – a growing city’ aiming for a sustained enhancement of Wilhelmsburg and city expansion towards the south.

g) Policies

Like Bremen and Berlin, Hamburg is a city state, the other 13 federal states are area states and have a capital. The government and parliament have their common seat in the Rathaus or City Hall. The left wing of the building belongs to the parliament, the right one to the state government.

The Hamburg state parliament is called the Bürgerschaft. It consists of 121 representatives, who are elected every four years under a system of proportional representation. The State Parliament elects the head of government, passes state laws and adopts the budget. Laws may be introduced by the Senate, the State Parliament, or by means of a petition for a referendum.

The First Mayor is the head of government. The Senate represents the Free and Hanseatic City of Hamburg in matters with the other federal states, the Federal Government and other countries.

The city is administered by the Senate. In order to ensure that the administration is responsive to citizens’ interests, Hamburg is divided into seven districts. The districts are administered by a district authority and local authorities. Simultaneously with elections to the state parliament, district assemblies - each with 41 representatives - are elected as representatives of the citizens (FHH 2010).

The area of the municipality of Hamburg is subdivided into seven city districts Altona, Bergedorf, Eimsbüttel, Hamburg Mitte, Hamburg-Nord, Harburg, Wandsbek which each having their own authority. Due to a reorganisation of the municipality of Hamburg the quarter Wilhelmsburg changed from the district ‘Harburg’ to ‘Hamburg-Mitte’ at the beginning of the year 2008. The local authorities is responsible for Wilhelmsburg and Veddel.

2) The need for an integrated strategy

Hamburg is a city where water is abundant. The local water balance shows that there is an amount of 35% of water originating from precipitation needs to be drained on the surface. Besides rain water management has to consider the Elbe river dynamics, ground water issues and the vicinity to the coast. This causes a number of challenges regarding water management such as flood risks, flash floods and limited capacity of the existing sewerage system.

The island of Wilhelmsburg, as part of the city of Hamburg, is the largest river island in Europe. It is determined to be the main area of the future urban development and, is characterised by the combination of 'technical' water management problems (flood risks, storm water management etc.) and 'urban planning' demands (water as an element to develop attractive locations etc.). Regarding these problems the SWITCH-delegates in Hamburg decided, to focus the SWITCH activities on the river island of Wilhelmsburg. This area encloses many different issues that need to be considered carefully and well balanced. Conservation demands address the high ecologic quality of water bodies in Wilhelmsburg. Very sensitive and unique habitats developed due to local conditions. Agriculture is being practiced for centuries. Cultivation of land needs a careful regulation of water levels reaching from drainage to irrigation of fields and crops. Residential settlement enhanced when the diking was completed and formed the shape of the island as it appears today. In addition to this the expanding harbour and great influence of the urban development of the island. Wilhelmsburg is now in the centre of attention of the urban planning of the municipality of Hamburg. In the second half of the 1990s, Hamburg gradually began to discover the attractive potential of its waterfronts. The "Leap across the Elbe" from the inner city via the quarter "Hafen City", the Grasbrook, the Veddel and Wilhelmsburg towards the community of Harburg on the southern side of the Elbe river, is the core of the city's vision.

Because of the local diversity a number of demands and conflicts arise. To ensure a well balanced and well performing water management only an integrated approach is applicable. Demands have to be mediated carefully and conflicts have to be encountered. A holistic and interdisciplinary approach is capable to manage water in a sustainable way. This approach is crucial especially if conditions such as climate change is likely to carry out uncertainties need to be considered.

C. Creating a Vision for the Future

1) Vision Wilhelmsburg 2030

As result of the first workshop a common vision for the urban water management on the island of Wilhelmsburg in the year 2030 was developed:

'Make water visible and usefull' is the new image of the river island of Wilhelmsburg in the year 2030. The several water bodies are visible, accessible and perceivable and serve as attractive locations for recreation, living and working at, with and on the water. Beside the quality of urban design the new image of Wilhelmsburg requires an improvement of the quality of water, the ecological quality of the surface waters and a future oriented flood protection. The inhabitants of Wilhelmsburg are aware of the water demands, are informed about the sustainable water management and identify themselves with the river island.

The workshop demonstrates the necessity to the coordination the different projects on the river island of Wilhelmsburg related to water management and urban planning. In the sense of 'Water Sensitive Urban Design' the different parts of the urban water cycle as well as the demands of urban and landscape design should be managed in an integrated concept. The topics of the vision for the urban water management are refined:

2) Creators

Some stakeholders in urban water management are involved in the Hamburg SWITCH learning alliance. Initially, in 2007, the Learning Alliance consisted of a small "core" membership involving planners, academics/researchers, and ministries (such as the Ministry for Urban Development and Environment) and the Municipality. Since its initial formation, membership has expanded to include NGOs such as people interested in nature conservation on Wilhelmsburg and also various citizens groups interested in and sensitive to the needs of the inhabitants of the island.



Figure 3. Workshop Discussion on Visioning and Indicators (photos: K.M. Dietrich)

Administration

Behörde für Stadtentwicklung und Umwelt Hamburg (State Ministry of Urban Development and Environment Hamburg (BSU)) is concerned with water management and urban planning, it is spread over a number of departments and has diverse responsibilities.

The BSU - LP as 'Department of Land Use and Landscape Planning' has overall responsibility for urban and landscape planning in Hamburg. The department prepares the overall concepts for the city of Hamburg as well as plans for defined spatial areas.

The BSU – U as 'Department of Environmental Protection' is responsible for ministerial and central municipal tasks concerning the soil protection, the waste management and the protection of water bodies. For the river island of Wilhelmsburg (as part of the planning site 'Elbe/Hafen') an extensive survey and valuation of the 'European Water Framework Directive' was carried out. The surface waters on the island are not part of the water framework directive (because of their small catchments area) but nevertheless they were considered in the survey.

City district authorities Hamburg Mitte. The city district authorities are responsible for the work that should be dealt with locally. The departments of urban planning and civil engineering deal with the matters of water management on a local level. So far the city districts work under direction of the BSU meaning that they have restricted powers and independence.

Landesbetrieb Straßen, Brücken und Gewässer (Provider for Streets, Bridges and Waters). Due to the reorganisation of the municipality of Hamburg the 'Landesbetrieb Straßen, Brücken und Gewässer' has taken over the functions of the former department 'Betrieb' of the BSU. The Landesbetrieb is the public service provider for matters of infrastructure and realises the municipal projects concerning civil and hydraulic engineering (Finanzbehörde et al. 2006). The 'Landesbetrieb Straßen, Brücken und Gewässer' is responsible for the building and construction of water management measures. The 'Landesbetrieb' is involved in all water related demands of the other planning departments (e.g. the urban planning activities of IBA and 'Leap Across the Elbe').

Hamburg Wasser (Hamburg Water). In January 2006 the 'Hamburger Stadtentwässerung' (HSE) and the 'Hamburger Wasser-werke' (HWW) merged into 'Hamburg Water'. This is the biggest municipal water supply and sewage disposal company in Germany (HSE n.d.). The affiliated group is organised as a municipal utility meaning the operation is dealt with by the municipal administration as a separate estate with independent accountancy. 'Hamburg Water' is responsible for the management of the sewer system as well as the water supply in the whole city of Hamburg including the Wilhelmsburg quarter.

Hamburg Port Authority (HPA) is responsible for certain areas of the harbour of Hamburg, the national water ways and attached water bodies. The HPA has two functions on the river island of Wilhelmsburg; responsibility for the spatial planning in the harbour area (e.g. the area along the Reiherstieg) and developing an integrated concept for the sustainable development of the River Elbe.

'Wasserverband Wilhelmsburger Osten' is the water association responsible for the management and maintenance of the drainage and irrigation system east of the railway line and south of the oxbow lake 'Dove Elbe'.

'Wassergenossenschaft der Anlieger des Verringkanals' is the association responsible for the canal 'Verringkanal' and the adjacent areas.

'Wassergenossenschaft des Schmidtkanals auf Wilhelmsburg' is the association responsible for the canal 'Schmidtkanal' and the adjacent areas.

'Sielverband Moorwerder' is the association responsible for the water management within the catchment of the tidal outlet 'Moorwerder.'

'Dachorganisation Wasserverbandstag Hamburg' is an association that acts as the head of all associations that are working for water management and management for land-use in Hamburg. The association is responsible for facilitation and coordination of the work of the locally active associations.

Internationale Bauausstellung Hamburg GmbH und Internationale Gartenbauausstellung Hamburg GmbH (International Building Exhibition Hamburg Inc. and International Horticultural Exhibition Hamburg Inc.) is responsible for the implementation of the exhibition and was founded in the year 2006. The IBA demonstrates strategies for the adaptation to global climate change. IBA Inc. is interested in 'Water Sensitive Urban Design' and is one of the core members of the SWITCH learning alliance. The 'International Horticultural Exhibition Hamburg Inc.' (IGS) is focused on the structural implementation of the exhibition. The responsibility is limited to the exhibition area. Both companies are closely related to each other on an organisational level.

Non-governmental organisations and civil-society organisations

Handelskammer Hamburg (Chamber of Commerce Hamburg) is a council for the self-administration of the economy. The council is an important stakeholder which represents the interests of the economy and has a wide influence on the municipality of Hamburg.

Siedlungs-Aktiengesellschaft Altona (Housing Corporation Altona (SAGA)) is the public sector housing corporation of the municipality of Hamburg. In recent years the corporation carried out several redevelopment activities on the river island of Wilhelmsburg and supported the management of quarters with social conflicts.

Beirat Wilhelmsburg (District advisory Urban Development Committee Wilhelmsburg) was generated by the general social unrest in the area at the end of the 1980s and in the early 1990s. The committee is concerned with all questions relating to the urban redevelopment of Wilhelmsburg.

Verein Zukunft Elbinsel Wilhelmsburg e.V. (Society for the Future of the River Island of Wilhelmsburg) arose from the 'Future Conference Wilhelmsburg' which took place in 2001/2. The objective is to facilitate the improvement of the river island of Wilhelmsburg. The association is focused on the effect of water management for urban planning and several water related projects should be coordinated.

BUND Landesverband Hamburg e.V. (Union for Environmental Protection and Conservation Hamburg) was founded in the year 1981 and is part of the nationwide 'Union for Environmental Protection and Conservation'. The association is involved in several themes of environmental protection and nature conservation in Hamburg.

GÖP Gesellschaft für Ökologische Planung e.V. (Society for ecological planning) is focused on the maintenance of nature conservation areas and the development of biotopes.

Zukunftsrat Hamburg (Future Council Hamburg) is a pooling of associations, institutions and companies which contribute to the sustainable development of Hamburg.

Türkischer Elternverein (Turkish Parents Association) is an ethnic minority organisation primarily interested in themes such as the improvement of educational chances, the finding of jobs, improvement of language skills and maintenance of their own cultural expressions. The SWITCH team have been working especially hard to engage with minority groups on the island of Wilhelmsburg, but unfortunately these groups are, at present, unable to see the benefit and are more concerned with education, employment, social welfare and housing.

Research

HafenCity University Hamburg– Landscape Architecture and Planning (and institute of Prof. Dickhaut) provides research activities. At the centre of attention is 'Water Sensitive Urban Design'. The state of the art and best practice of Water Sensitive Urban Design solutions are analysed. The approach of WSUD corresponds with the requirement of the every day work in Hamburg, a combination of 'technical' water management problems (flood risks, storm water management etc.) and 'urban planning' demands (water as an element to develop attractive locations, planning in urban transformation processes etc.). Hafen City University is a key stakeholder, it not only undertakes research but also facilitates and coordinates the management of the learning alliance.

Technical University Hamburg Harburg: Research about eco-sanitation in SWITCH WP 4.2; co-operation with Hamburg Wasser in the planned demonstration project 'Haulander Weg'.

3) Goals with main points and indicators of success

Water as an element of urban and landscape design

The element water is important for the urban and landscape design of the river island of Wilhelmsburg. The widely ramified artificial ditch network is a connecting element in the heterogeneous landscape. Images for a positive identification of the inhabitants with the river island are missing. Therefore it is necessary to use the element water to develop identity-establishing locations.

On the island attractive locations for living, working and recreation at, with and on the water should be developed. The accessibility, visibility and usability of the surface waters and their banks should be improved. The quality of landscape design at the water should be supported and the possibilities to use the waters for shipping should be enhanced.

The attractive urban and landscape design of the surface waters required the improvement of the water quality, the improvement of the ecological function as well as innovative flood protection measures. Synergies between the demands of urban design, ecology and water management are intended. The successes of water management should be made visible and presented in public.

Water pollution control

A high quality of water is important for the visibility and usability of the surface waters, their ecological function and the development of attractive locations. Therefore the bad water quality of the surface waters should be improved. The improvement requires a spread of interdisciplinary measures: reduction of the discharge of polluted storm water, reduction of the infiltration of ground water which is enriched with iron, rehabilitation of inherited waste, improvement of auto purification of the waters etc. Furthermore the awareness of the inhabitants for the value of clean water should be improved to facilitate the change of

behaviour. The 'Department of Water Pollution Control' already started first activities for the improvement of the water quality but additional activities are required. The costs for the water pollution control should be estimated in relation to the worth of clean water.

Surface waters as connected ecosystems

The surface waters on the river island of Wilhelmsburg have an important ecological function. On the one hand the surface waters are an important habitat for several animals and plants worth of protection. On the other hand the minor ditches, drainage ditches, lakes, canals, oxbow lakes and the arms of the river Elbe are an important part of the cultural landscape. The improvement of the structure of the riverbanks as well as the improvement of the ecological habitat connection is required. Also an extensive land use and the protection of the cultural landscape are required. For the protection of the ground water the urban development should be focused on the redevelopment of brownfield sites.

Sustainable flood protection

The expected global climate changes as well as the planned deepening of the river Elbe have effects on the flood protection of the island of Wilhelmsburg. To guarantee the existentially future of the island an innovative and sustainable flood protection is required. So the design of the flood protection barriers should facilitate the adaptation of the height of the dikes as well as the visibility and usability of the riverbanks. Also the regional strategy to develop additional retention space for tidal floods is supported.

Awareness of the inhabitants for water demands

The awareness of the inhabitants of Wilhelmsburg for the demands of the element water should be developed. On the one hand the affinity of the inhabitants with the river island should be supported to develop a unique identity. On the other hand the inhabitants should be informed about water pollution control and flood protection to achieve changes in the behaviour of the inhabitants.

D. The methodological approach of developing strategic directions for an integrated urban water management

A series of discussions and workshops was conducted to investigate how an integrated urban water management for Wilhelmsburg in the year 2030 should look like. The first objective was to find a common vision for the urban water management on the island of Wilhelmsburg in the year 2030.

The following vision was formulated: 'Make water visible and useful'. The learning alliance believes this slogan is most suitable for the new image of the river island of Wilhelmsburg in the year 2030. The vision comprises that in the future several water bodies are visible, accessible and perceivable and serve as attractive locations for recreation, living and working at, with and on the water. Two main aspects are addressed by that image: the quality of urban living and the improvement of water quality. In addition to this it is the objective to enhance the awareness of the inhabitants of Wilhelmsburg regarding water demands and that they are informed about sustainable water management and that they identify themselves with the river island.

The discussion demonstrated the necessity of the coordination the different projects on the river island of Wilhelmsburg related to water management and urban planning. Therefore the integrated water management is the only concept to ensure a sustainable but also demand orientated water management.

It was agreed to discuss how the vision could be achieved by focusing upon two specific water related issues.

3. water regulation system on the island of Wilhelmsburg
4. recreation and conservation on the island of Wilhelmsburg

Workshops were conducted for each topic.

1) Water Regulation System on the Island of Wilhelmsburg

The focus of the Workshop and the preparatory work was the analysis and description of the regulation system as well as the investigation of demands of different stakeholders regarding water levels in the ditches.

The system is highly complex and consists of pumps, tidal gates and a number of weirs to regulate the level in the ditches and even single sections of those. These technical facilities are interconnected and influence the direction of flow and the water levels.

This comprises:

- Identification of central elements of the regulation system and their interconnection
- Determination of existing conflicts that are caused by the water regulation system
- Discussion of proposals regarding changes of water levels. Analysis of positive and negative impacts resulting from proposed changes as well as development of ideas for solutions to encounter resulting conflicts.

a) The need for a regulation of water levels

The environmental conditions of the Elbe river island are the reason for the necessity of water regulation. The structure of surface water bodies reflects the appearance of the natural water bodies from which they originate. It also reflects the structure of the historic drainage system that was established to cultivate land. In advance of diking, the island was separated into a number of smaller ones. These islands were separated by several river channels. Tidal dynamics created tidal gullies which determined the shape of these islands. After diking the hydrologic system of the island got disconnected from the Elbe and the tidal influence. However, the structure of gullies and river channels can be seen by the surface water bodies, the so called "Wettern" and the pattern they produce. These water bodies serve for drainage and irrigation of land behind the dike.

Beside these linear water bodies there are areal ponds. These are so called "Bracks" are remnants of historical flood events that occurred in the past when the dikes broke or got overflowed. These events created potholes that stayed after water retrieved from the land. Persistence of these "Bracks" is ensured by the impermeability of underground which limits infiltration on the one hand and the high groundwater table on the other hand.

b) Topography and water levels

The elevation of the Elbe river island Wilhelmsburg is very low and varies between 0.5 and 1 mm above sea level. The level of high tide is at 2.23m above sea level.

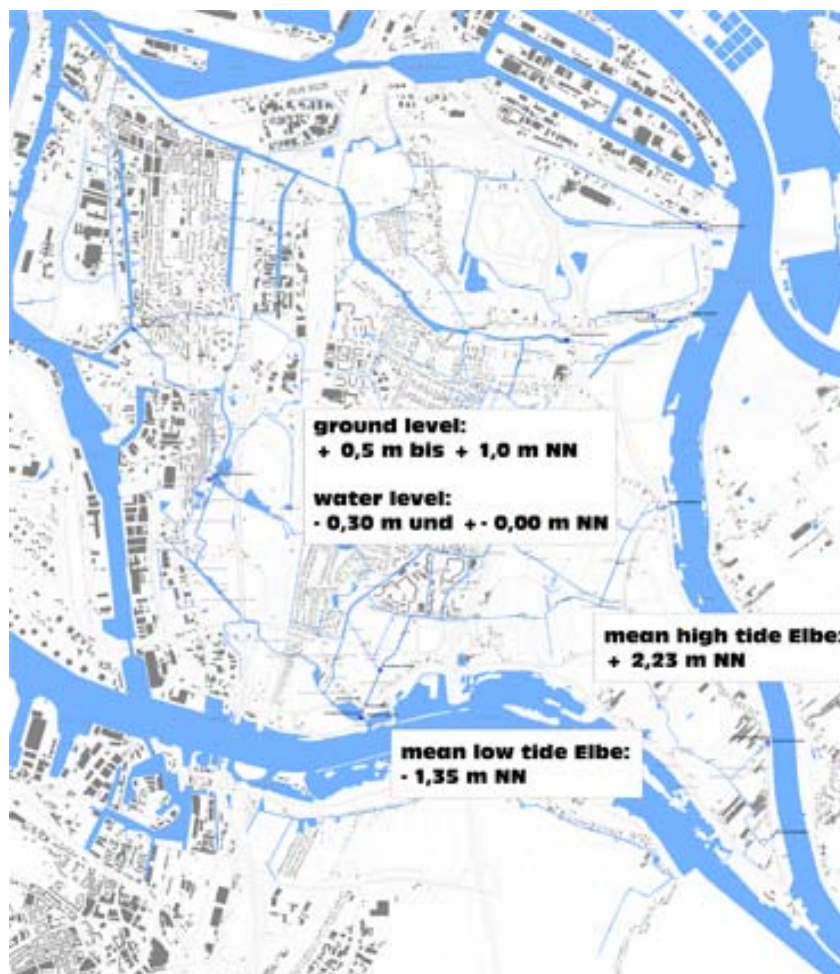


Figure 4. Topography and Water Levels of Surface Water Bodies on the River Island Wilhelmsburg (HCU 2010; Deutsche Grundkarte)

This results in a situation where inland water levels are below the water level of the Elbe river outside the dike throughout the major period of time during one day. Land surface as well is during a considerable fraction of daytime below water levels of the Elbe river. This creates a necessity for pumping water to be drained from the land surface towards the river to overcome differences of water levels on either side of the dike.

In chapter „water balance“ it was shown that climatically water balance from September to March the is positive while it is negative throughout the rest of the year. The system has been adapted to this climate conditions and drainage is changed to irrigation when water balance turns to be negative to ensure cultivation of areas that are used for agriculture. So, compared to winter, water levels are risen during summer in some sections of some “Wettern”.

To preserve natural environment on the one hand but also ensure applicability of areas for urban development and agriculture on the other hand the well functioning of the drainage and irrigation system as such and considering its complexity is very important.

c) The elements of the regulation system

10 tidal gates and 9 pumping station ensure functionality of the drainage and irrigation system. Pumping of water is necessary to overcome differences of water levels at either side of the dike. Only at one tidal gate “Goetjensort“, the gradient of the slope is sufficient to ensure drainage at any stage of tidal influenced water level of the Elbe river unless a storm flood event occurs.

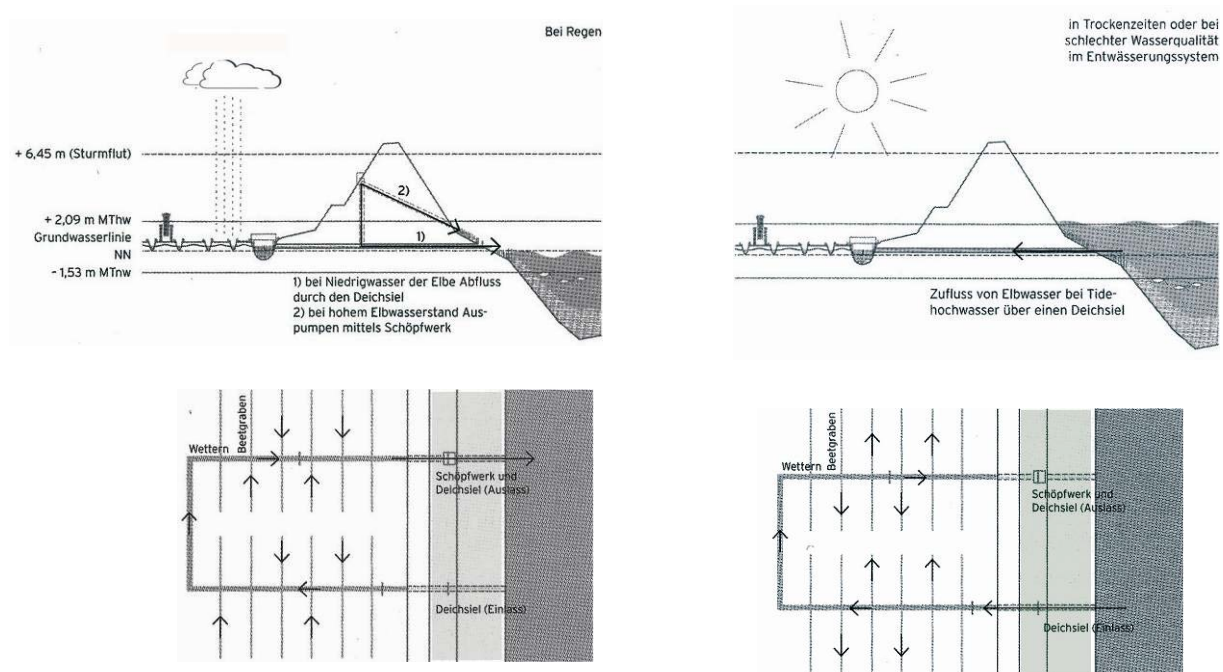


Figure 5. Schematic Depiction of Functionality of the Drainage and Irrigation System (Internationale Bauausstellung Hamburg (Ed.), 2008)

Map of the Finkenriek area showing the Elbe river, tidal gates, and pumping stations. The map includes labels for "tidal gate "Kirchdorfer Siel"", "pumping station "Finkenriek"", "tidal gate "Neues Brausiel"", "tidal gate "Finkenriek"", and "pumping station "Stillhorn"". Water levels are indicated by black dots with values like -0.15, -0.30, +0.30, and -0.55. A legend at the bottom shows a black arrow for "direction of flow" and a black dot for "-0,13 water level (m below sea level)".

A pattern of 8 watersheds results according to the location of the pumping stations. The watersheds of the pumping stations „Finkenriek“, „Sperlsdeich“ and „Kuckuckshorn“ are the largest ones.

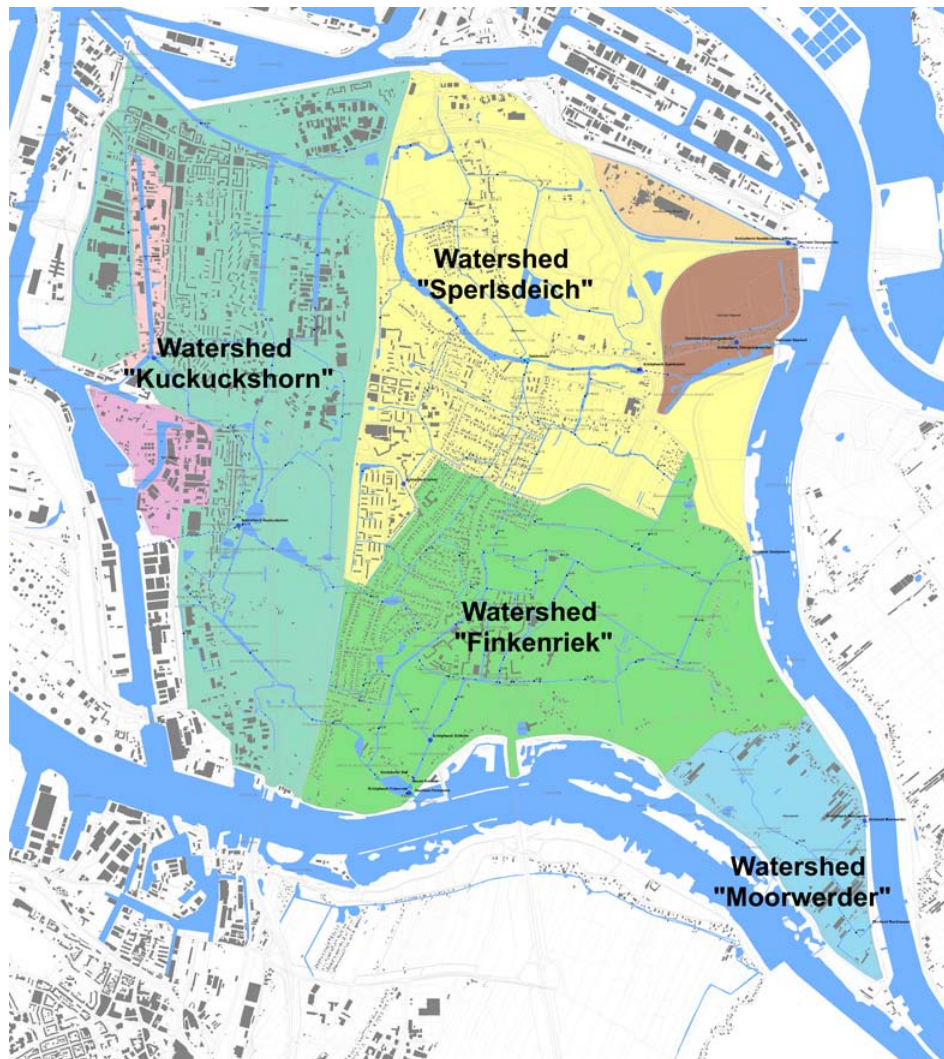


Figure 7. The Pattern of Watersheds Depends on the Location of Pumping Stations (HCU 2010; Deutsche Grundkarte)

The watersheds of Wilhelmsburg can be subsumed into 4 sections according to the location of pumping stations. Three of them are interconnected to ensure drainage in those cases when one pumping station fails. One section is working independently. This also shows the high complexity of the water regulation system of the river island. In addition to this there is a number of smaller watersheds that also work independently and therefore ingest a more local influence.



Figure 8. Pumping Station and Tidal Gate Finkenriek (left), Tidal Gate: “Neues Brausiel” (right) (photos: B. Weber)

The responsibilities for planning and maintenance of ditches, trenches and weirs are divided between the Free and Hanseatic City of Hamburg, the Department of Urban Development and Environment (BSU) and the District Authority Hamburg Mitte (Bezirksamt Hamburg Mitte). Related institutions are the State Office for Roads, Bridges and Waterways (responsible for maintenance and functionality of pumping stations and tidal gates), various water and soil organisations and the port authority.

d) Demands and conflicts related to different water levels and their management

Demands that required a rise of water levels:

1. Residents want more water in residential areas to ensure irrigation of gardens and green spaces
2. In open and more agriculturally used areas water levels should be risen to improve ecologic value
3. Reduction of "Verockerung" (naturally existing iron minerals in the topsoil layer are washed out during rainfall events and reach ditches which results in pollution of the water system and reduction of water quality).

→ related conflicts:

1. Availability of water concurs with the state of the art of management and performance of the water regulation system.
2. High water levels that are desirable for conservation purposes in not built-up area are in conflict with the demands of agriculture.
3. Reduction of „Verockerung“ are opposing the state of the art of management and performance of water regulation.



Figure 9. Demands Regarding Management of Water Levels Result in Conflicts Between Agriculture and Conservation (photos: K.M. Dietrich)

Demands that required less variation of water levels:

1. Little variations of water levels would facilitate permanent use for recreation such as canoeing, because peers are usable during more often.
2. The IGS planning comprise the construction of a canoeing track that requires a stable water level of -0.15 m below sea level.
3. Little variations of water levels are of high value for the local ecosystem that is adapted to tidal changes.
4. Sudden inflow of water that provokes quick changes is not desired from the nature conservation point of view, because it has a bad impact on the sensitive aquatic ecosystem.
5. Changes of water levels (especially reduction of) are suspicious to be responsible for land subsidence. These effects should be eliminated

➔ related conflicts:

1. Short term changes due to water level regulation are in conflict with recreational demands.
2. Changes of water levels are important for agriculture
3. Changes of water levels result in exposure of wooden foundations of bridges which affects a high need for reparation work.
4. Missing knowledge about the influences of water (surface water or ground water) which cause land subsidence.

Demands that required higher variation of water levels:

1. Creating connections between inland water bodies such as the „Rhee“ to the fluvial dynamics of the Elbe river
2. Changing water levels with controlled inundation of certain areas would result in a higher sensitivity of awareness of residents towards the importance of the regulation system.
3. Changing water levels with controlled inundation of certain areas would result in a higher sensitivity of awareness of residents towards ecological value, functionality and performance of the regulation system.

➔ related conflicts:

1. Connections between inland water bodies and the Elbe river would result in high costs for alteration and reconstruction of the regulating technical facilities.
2. Lacking perception of residents towards the fact of living on an island as such and living in an area that is highly prone to be flooded during storm flood events.
3. Pollution of water bodies.

There is a general retention:

The system of water regulation is so sensitive that an alteration is not feasible, because it would lead to instability of the system as such.

Many versions of planning are not even being discussed because of that retention.

e) Discussion and Findings

The general perception can be described best as a situation where many actions towards a further integration of urban water management are being undertaken but consistency of this work is missing. Restrictions of time and resources result in approaches of solutions only, but the links between solutions and implementation are missing. Many Stakeholders desire more consistency of work related to water issues in Wilhelmsburg.

Awareness of residents towards the relevance of water system

The perception of residents towards the importance of water bodies and the regulation of water levels seem to be lacking generally. Obviously residents do not seem to realize that the management of the water system is ensuring their livelihood and the allocation of land for agriculture, settlement, commerce and industry. It does not seem to be understood that living on an island is highly endangered by storm floods and that the regulation system preserves the area of floods.

The condition of ditches reflects that. Many of them are polluted and are not in a well maintained state. The local authorities are limited in resources to offer sufficient education and public relation. This forces people to gather information regarding this topic by themselves but they do not receive appropriate guidance.

Up to date most of the educational work focuses upon emergency management due to storm floods and the importance of dikes in general but the importance of local functionality of sometimes small water bodies is not transparent to residents. Besides this it turned out that ways of communication could be improved or at least should be used more effectively and consistently. Based on this the need for a concept arose to essentially improve paths of communication. It has to be emphasized that such a concept needs to be appropriately designed to meet the challenges of Wilhelmsburg.



Figure 10. Workshop Discussion on Demands and Conflicts Regarding the Water Level Regulation System (photos: N. Klostermann-Rohleder)

Because Wilhelmsburg is a district with a high ratio of residents with a foreign background, it is of great importance to involve this part of population in the process of information and education. This is crucial for the sustainable management of water bodies on the island. This is a big issue in Wilhelmsburg because up to date residents with foreign background are mostly excluded from participating in planning processes. During the discussion addressing

children is of high value as they 'serve' as multipliers of dissemination of information. There is a need for further information of users of peers for recreational uses to enhance understanding of changes of water levels, because there is a conflict between canoeists and changing water levels that influence the use of peers which is not optimal at all times. One solution could be to build floating peers. This in turn would lead to costs that are needed for planning, administrative approval and construction. Users are mostly overwhelmed by the procedure of this kind of approval planning.

A scenario with higher water levels is always accompanied by the discussion of security aspects. Drowning of children is an argument that is almost impossible to overcome during planning processes. In addition to this, legal situation has to be considered and law would be needed to be adapted in some cases.

Deficiencies of knowledge

Land subsidence is identified as one central problem in Wilhelmsburg. This effect has already caused problems regarding conditions of building stock and roads. Investigations have been undertaken to analyze the influence of ground and surface water but have not shown a subsidence of ground water table. Changes due to the regulation of surface water levels might be one cause of the effect, but its role is not determined yet. In summary the causes of land subsidence are not identified up to date. Further investigations to clarify the effect are being claimed by many stakeholders.

Performance of the system

Some stakeholders feel that the system at this stage is performing well. Current project planning is adapted and relies on the state of the art of its functionality and the current water levels. In addition to this the situation of land use is adapted to the local water level situation as well. This is also true for the local environment which has adapted to existing conditions e.g. vegetative association. Alterations of the system would mean a phase of testing to adjust the altered regulation system to ensure functionality again. This leads to a phase of uncertainty regarding the performance until the adjustments are working properly.

Relevance of the 'Regional Water Management Concept Wilhelmsburg'

Water management on the river island of Wilhelmsburg is documented in the 'Regional Water Management Concept Wilhelmsburg' (FHH 1998). Many stakeholders feel this document to be a helpful guidance regarding planning which affects water issues. But other instruments such as the landscape plan are perceived to be of much higher importance concerning spatial and water related planning. Many stakeholders believe that the 'Regional Water Management Concept Wilhelmsburg' needs to be updated. However, no updating has been initiated yet.

2) Recreation and Conservation of water bodies in Wilhelmsburg

The focus of the topic is an analysis of environmental conditions of surface water bodies, the surrounding areas on the one hand and recreational demands on the other hand. The objective was to find solutions for the future of how to integrate contrasting demands: conservation vs. recreation. The aim is to develop ideas to form a strategy towards a well balanced management of water bodies considering these contrasting demands.

To assess the existing environmental conditions a consulting company (Planula) was assigned to map the relevant parameters. In addition to this, mapping of accessibility of water bodies as well as existing recreation activities and related facilities were also assigned. Besides these investigations an online questionnaire was produced which invited inhabitants and other stakeholders to interactively map how they use the water bodies and their embankments for recreational purposes and their ideas of recreational use in the future. To avoid exclusion of those who are not used to internet use the questionnaire was also expanded by conducting interviews with residents in public areas.

It appeared that inhabitants use water bodies and their embankments for a number of different recreational activities. Rowing, taking a walk, swimming and having a barbecue are some of these activities. The analysis revealed an already high recreational demand and a high ecologic value of the water bodies themselves and the adjacent areas. During the process of developing strategic directions for this topic, it is also discussed if rules for recreational activities should be implemented to ensure the ecologic value and quality of the water bodies.



Figure 11. Contrasting Demands: Recreation and Conservation (photos: K.M. Dietrich)

a) Background and approach

The background for working on the topic is given by the structural diversity of the Island. Different types of land uses coexist adjacent to each other resulting in a number of different and sometimes concurring demands towards water management. Besides the diversity of landuses the demographic situation exerts a variety of different demands of uses along the waterbodies of Wilhelmsburg. The situation can in short be described as an island of where areas with high habitat qualities and areas with intensive human activities overlap each other in many places. An integrated approach to ensure both high ecologic values and recreational demands of residents is needed.

Two main aspects that evolve conflicts are

- environmental conditions
- demografic situation (different landuses and population growth)

Table 5: Demographic Data in Wilhelmsburg (Statistikamt Nord 2010b)

	1987	2009
Population (total)	44,047	50,091
Percentage of inhabitants under 18 years	19.4%	22.1%
Percentage of inhabitants above 65 years	14.3%	14.2%
moves away form Wilhelmsburg	6,492	5,042
moves to Wilhelmsburg	6,284	4,371
Percentage of inhabitants with foreign backround	10,046 (22.8%)	16,810 (33.6%)

The objective of discussing this topic was to develop strategies to separate and integrate recreational and conservational demands.

The first step was to analyse and assess all water bodies regarding their environmental conditions and there eligibility for recreational uses.

The following parameters where examined:

- ecological value of water bodies and the adjacent areas
- accessibility of water bodies
- recreational activities

b) Ecological value and accessibility of water bodies

Habitat Qualities

The river island Wilhelmsburg is characterized by a heterogenic habitats with very different ecologic qualities. There are some nature protection areas while there are many areas with only little ecologic values. The proximity of areas with contrasting ecologic values is striking. In some parts areas that are protected by conservation regulation with high values are directly adjacent to areas with little ecologic value. This situation is most prominent in boundary areas of the settlements.

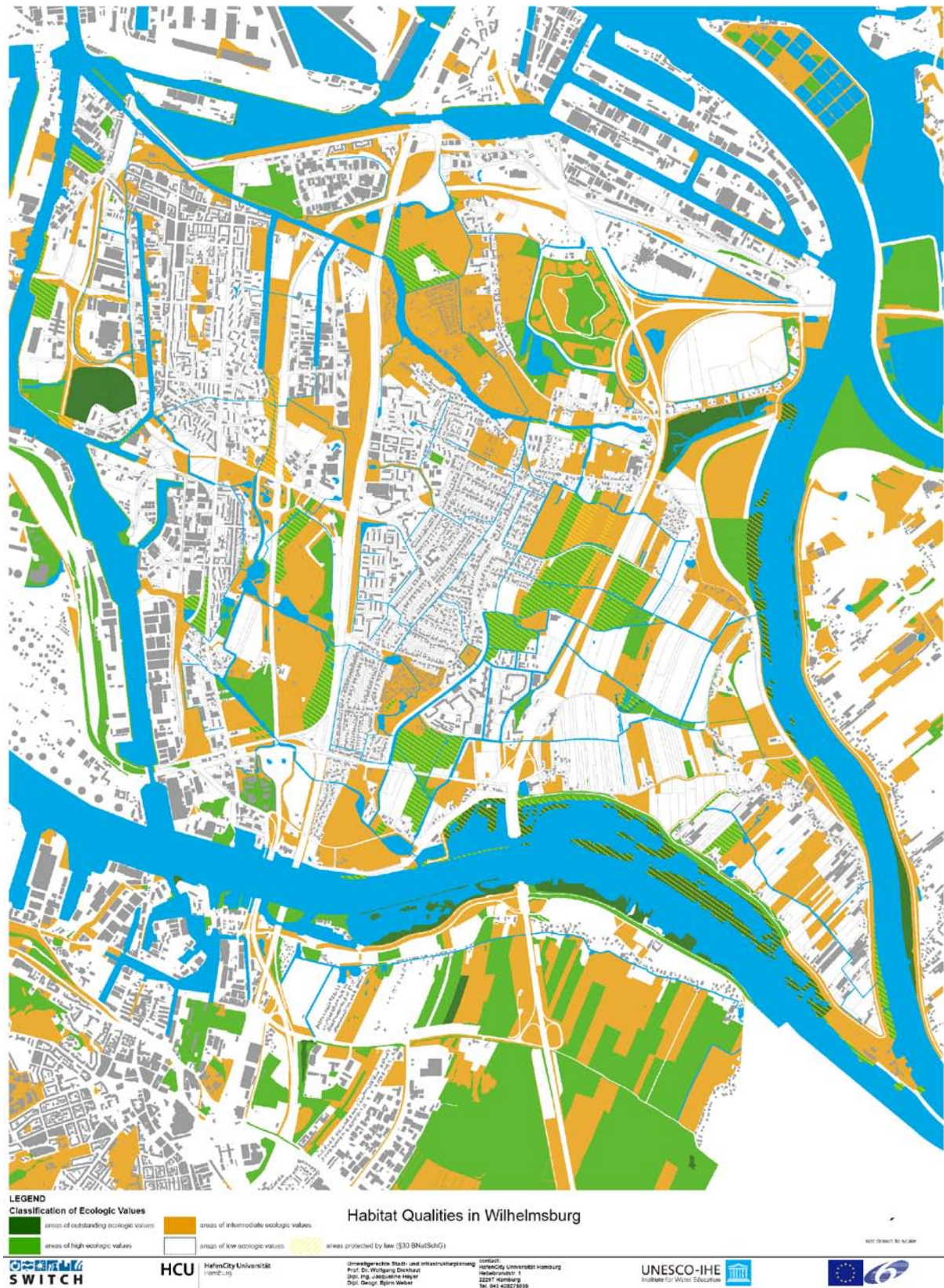


Figure 12. Map of Habitat Qualities (HCU 2010; Deutsche Grundkarte)

Accessibility

Within SWITCH a mapping was conducted to assess the accessibility of embankments.

The water bodies in the harbour areas are mainly inaccessible. This applies to the water bodies in the eastern areas, which are mainly used for agriculture, too.

The embankments of centrally situated water bodies are either inaccessible due to private properties that is adjacent or are open to the public.

The canals in the north and northwest are mainly open to the public and easy to access.

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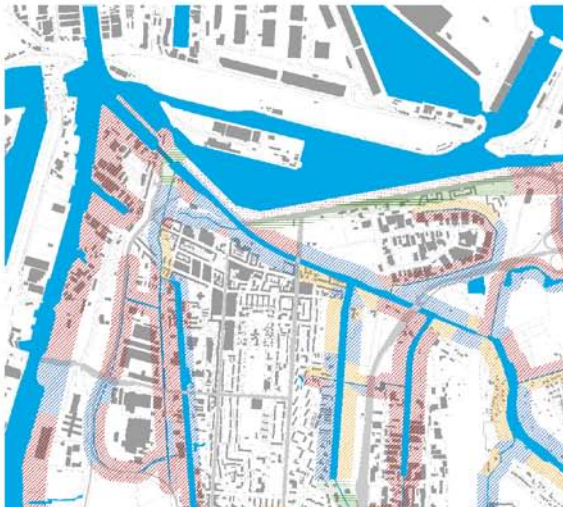


Figure 13. Map of Accessibility of Water Bodies (HCU 2010; Deutsche Grundkarte)

c) Recreation at the water bodies

During the progress of the project the existing types of recreational uses were assessed. Mapping of facilities for recreational uses as well as investigation of recreational demands was conducted. To investigate the recreational behaviour of inhabitants an online panel (www.wilhelmsburgamwasser.de) was established.

Besides this, interviews of inhabitants were conducted in public locations. During the questionnaires people were asked to locate their recreational activities. The participants were asked to use maps to plot those locations. This method was possible for both kinds of questionnaires; the online based one was provided with interactive maps while paper based versions were used for the one-to-one interviews.

Box 1: questionnaire for recreational behaviour:

- *What do you do along the water bodies of Wilhelmsburg? (taking walk, riding a bike, taking the dog for a walk, rowing or driving a boat, having a barbecue, fishing, swimming, enjoying nature)*
- *Which of these activities would you like to do in the future?*
- *What do you think about regulating the use of water bodies?*
- *Which areas do you think should be retained for the nature? - Why?*

Results:

biking, taking (the dog for) a walk:

The spatial distribution of these activities shows that they are undertaken all over the island. The canals in the northwest and the dike around the island are very popular for using in this respect



Figure 14. Map of Activities: Biking, Taking (the Dog for) a Walk (HCU 2010; Deutsche Grundkarte)

rowing and driving a boat:

The canals in the north and northwest particularly provide suitable conditions for these activities. Surprisingly, even the smaller ditches and trenches are used for rowing although there are many weirs that oppose barriers for a continuous practice of this type of activity.

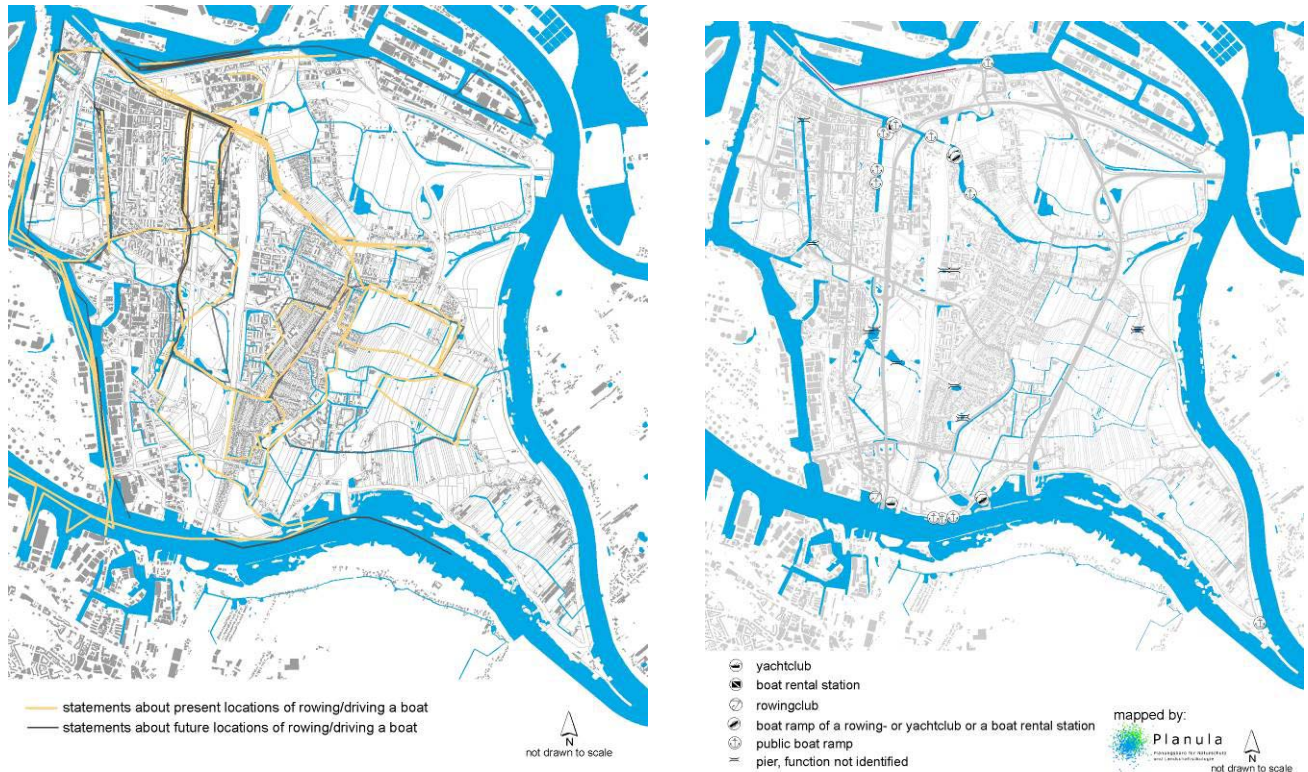


Figure 15. Map of Activities: Rowing/Driving a Boat (left); Mapped Facilities for Rowing and Driving a Boat (HCU 2010; Deutsche Grundkarte)

swimming:

The beach along the southern part of the Elbe river is popular for swimming. But even the canals, the harbour and some ponds are used for this type of recreational activity, which is more surprising. As can be seen in the map, there is a high demand for additional possibilities for swimming.

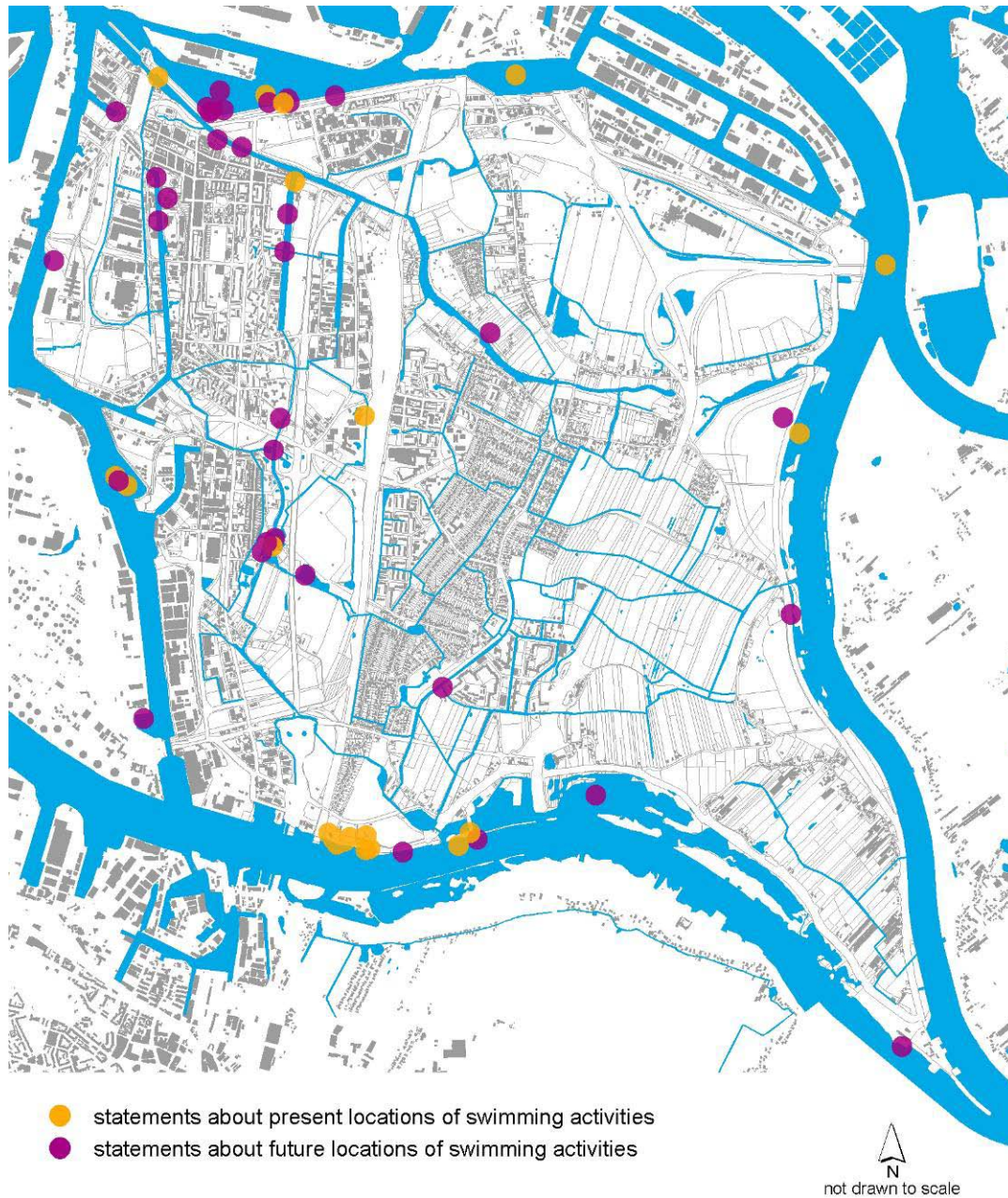


Figure 16. Map of Activities: Swimming (HCU 2010; Deutsche Grundkarte)

enjoying nature:

The overall question was how conservation and recreation could be managed in terms of integrating and separating uses. It appears that many places are used for observing and enjoying nature. The variety of answers shows that many places are felt that they should be conserved for nature. In comparison to the map of habitat qualities it appears that many areas with a high need for conservation are in or near the settlements. Other areas that are more remote and show high ecologic values are not represented adequately in the number of answers. It can be assumed that accessibility and distance of areas play a role in personal perception. This leads to this type of picture where areas that are close to the settlement and that are easy to access are overrepresented in the number of answers, while areas that are more remote and difficult to access receive less attention. Comparing the map of accessibility of water bodies strengthens this assumption.



Figure 17. Map of Activities: Observing and Enjoying Nature (HCU 2010; Deutsche Grundkarte)

barbecue:

This activity is often observed to be disturbing towards other recreational activities (DWA 2007). In Wilhelmsburg many places are used for having a barbecue. The canals in the northwest and the beach in the south are popular areas. The spatial distribution of this activities and actually existing rest areas differ from each other. It can be concluded that this activity is often undertaken outside officially designated areas.

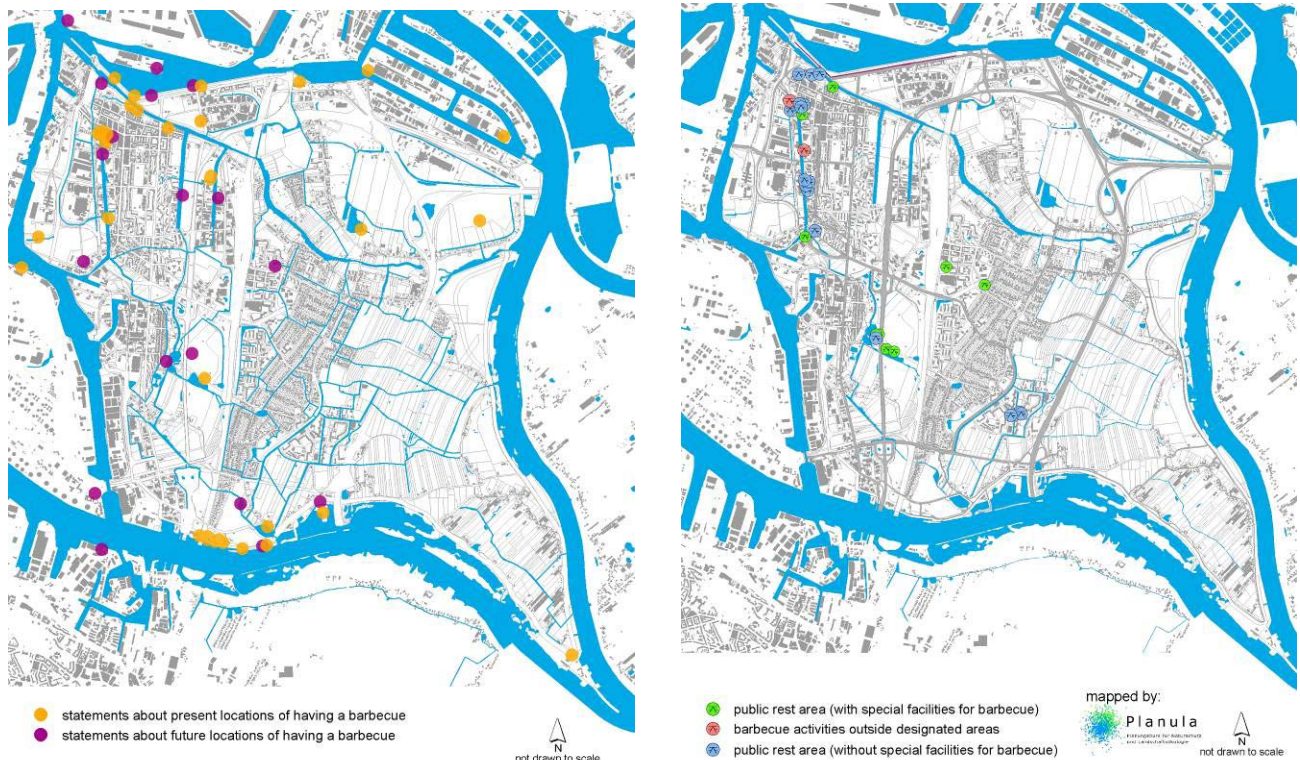


Figure 18. Map of Activities: Having a Barbecue(left); Mapped Rest Areas and Public Barbecue Facilities (HCU 2010; Deutsche Grundkarte)

Pollution of water bodies:

The discussion of an earlier SWITCH-workshop in Wilhelmsburg revealed the problem of pollution as a result of waste disposal into water bodies. This resulted in the incorporation of this aspect into the questionnaire. Participants were asked to plot the sites of heavy pollution into the map and to make a grading of the general degree of pollution (application of a school mark system where 1 = very clean and 6 = extremely polluted).

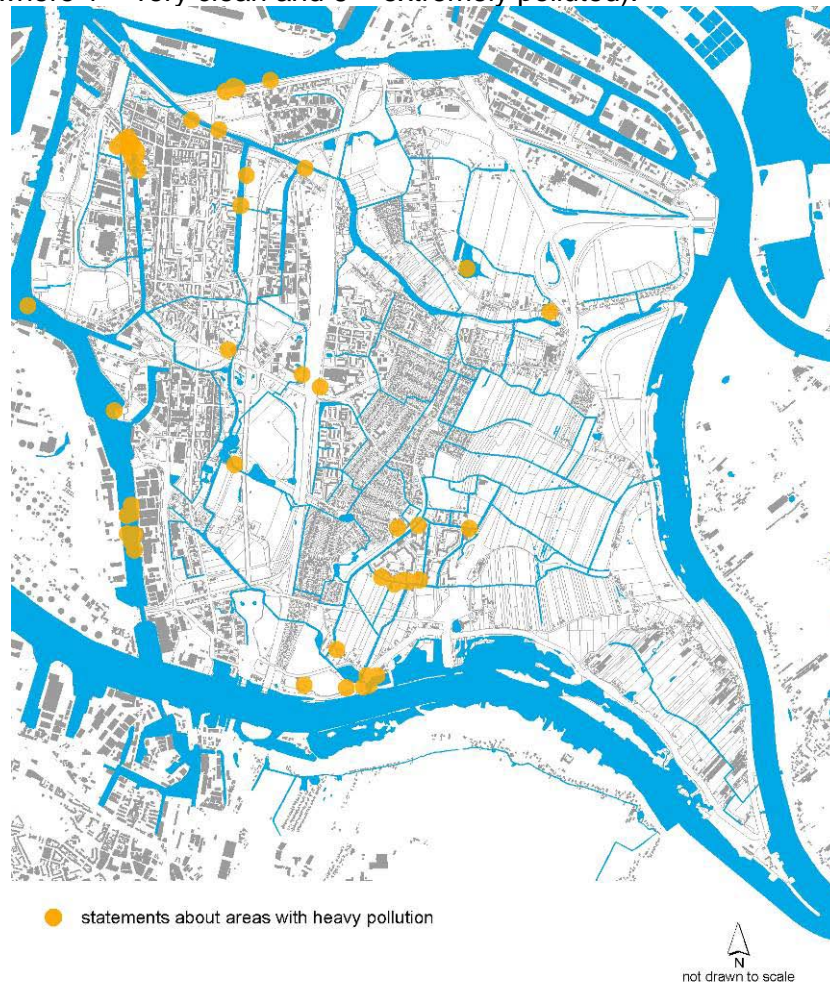


Figure 19. Map of Polluted Water Bodies (HCU 2010; Deutsche Grundkarte)

Table 6: Statements About the Degree of Pollution *difference to 100% result from unanswered question

The degree of pollution is mainly graded with marks 3 and 4. No participant perceives the water bodies to be very clean. A fraction of 4% state that water bodies are extremely polluted.

Grade of pollution (school mark)	Percentage of given statements
1	0
2	12
3	19
4	16
5	12
6	4

conflict zones:

The analyses of different types of recreational activities reveal areas where conflicts among different recreational activities and between those activities and nature conservation evolve. Three conflict zones were identified: one is situated in the northern end of the 'Veringkanal', around the centrally situated pond 'Kuckucksteich' and 'Kückenbrack' and a part of the 'Wilhelmsburger Dove-Elbe' in the north of the island.

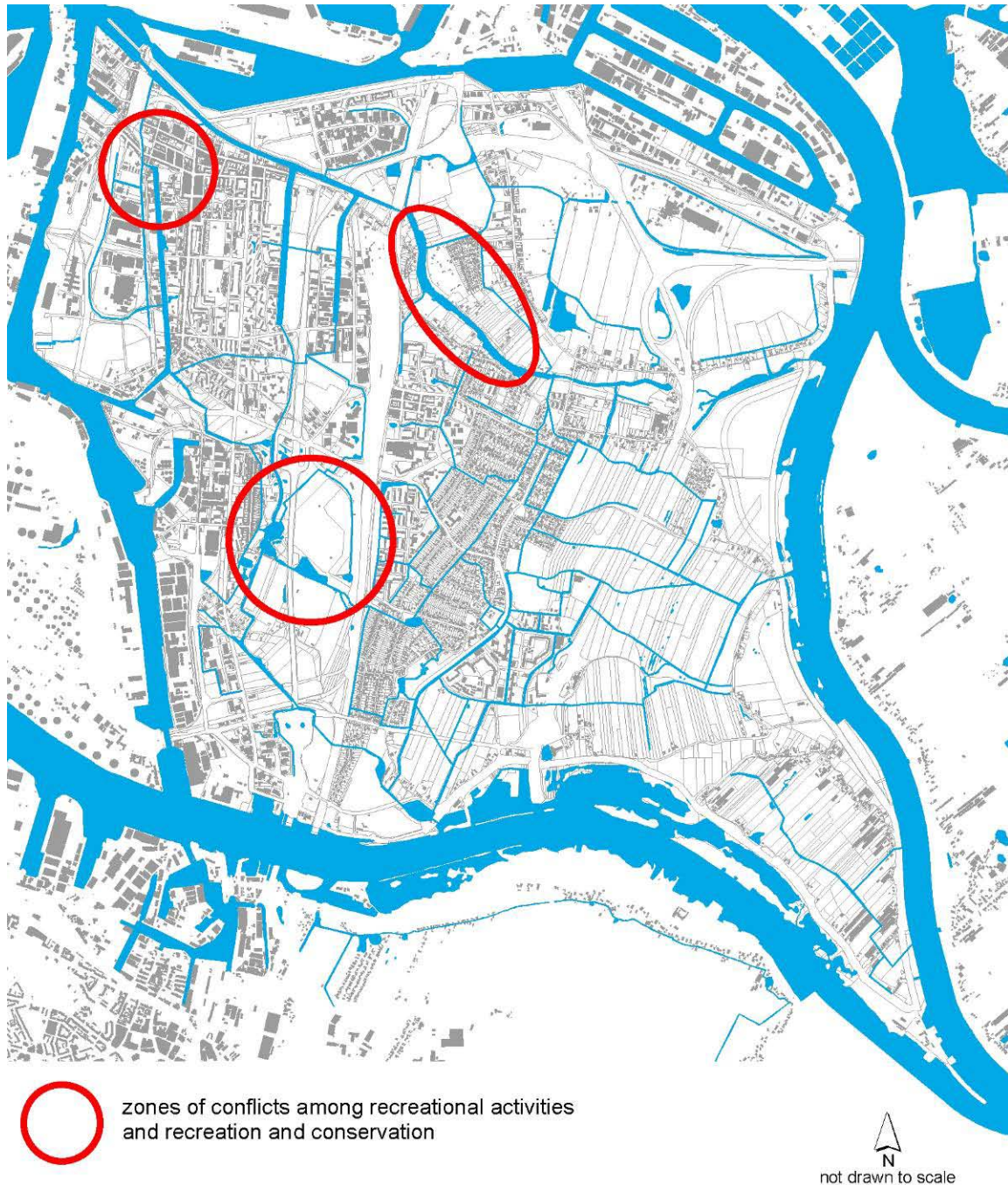


Figure 20. Map of Conflict Zones (HCU 2010; Deutsche Grundkarte)

establishing regulations

Participants of the questionnaire were asked about their opinion about setting regulations towards recreational activities. In Wilhelmsburg prohibition signs e.g. 'swimming prohibited' already exist.



Figure 21. Map of Prohibition Signs (HCU 2010; Deutsche Grundkarte)

The examination of statements reveals that 40% of participants voted for the establishment of regulations. A ratio of 19% voted against the setting of regulations. The remaining fraction did not state on this aspect.

d) Discussion and Findings

In October 2010 a workshop was conducted to discuss the possibilities to separate and integrate the demands of recreation and conservation. The aim was to improve the current management of concurring demands with respect to changing conditions such as demographic developments.

The following aspects were focused during the discussion:

What could be solutions for the future to integrate and separate contrasting demands of conservation and recreational use.

Could setting of regulations enhance the control of intensity of recreational activities support an integrated management?

The importance of a well balanced management was identified during the discussion. It was agreed that an integrated approach is essential for the improvement of management. The setting of regulations is not seen to be suitable for the integration and separation. An implementation and surveillance of further regulations are not believed to be realisable. Alternatively, measurements to design, shape and develop water bodies for specific recreational activities would be more effective to integrate recreation and conservation. The aim would be to create "Water Sites" to promote recreational activities in some parts, which would provide other areas for conservational purposes. These sites could evoke a drawing power for recreational demands.

Proposals to encounter the problem of pollution of water bodies could be:

1. deployment of caretakers
2. training and information campaigns in schools

The deployment of caretakers in public areas was discussed controversial and was finally not felt to be realisable.

Conducting training and providing information which could be used for educating school children was identified to be very important for the improvement of the acquaintance of water bodies in Wilhelmsburg.

Schoolchildren multiply the uptake of information, by carrying home provided information and transport the ideas into their social surrounding. This results in sensitising their fellow men.

It was emphasised that definitions of intensity of recreational uses should be determined for every water body individually. Generalisations should be avoided. It was discussed that not only recreational uses should be determined explicitly but also the extent of conservation. Ecologic values should not only be a result of intensity of uses but should also be determined explicitly.

Besides the discussion of possibilities for recreational uses of water bodies in Wilhelmsburg, the functionality which is draining and irrigating the island needs to be considered carefully. This function has to be ensured in any case and is of superior importance. This is of major concern especially regarding changes such as climate variations in terms of rising number and intensity of storm water occurrences.

It was proposed to transport the discussed aspects to convert them into realisable project ideas as a further step.

e) Future Prospects

Taking up the agreement of developing realisable project ideas as a next step, HCU assigned the elaboration of concept within SWITCH of how this can be done in the every day life. The company WasserLand produced a concept called “WasserKulturFörderung” that shows how the water related issues can be implemented into future urban planning in Wilhelmsburg by addressing social and cultural institutions. This concepts concentrates on using existing networks as the ones described in chap. ‘institutional’.

Box 2: results of the concept ‘WasserKultuFörderung’:

- create a specified ‘water network’ - cooperation of relevant stakeholders, associations, schools
- use existing networks in Wilhelmsburg
- training and education in schools: competitions excursions, cultural events etc.
- integrate art into nature to enhance perception

The concept gives contact information of institutions and persons to promote the ideas
In addition to this, first consultations have been undertaken in this framework to generate the first step of realising the ideas.

In the end of the workshop in October 2010 it was agreed to have a workshop-like meeting with a smaller group of key stakeholders to discuss possible funding and realisation of first ideas for pilot projects of examples for integrated urban water management. This meeting was held in November 2010. Results can be read in chap. ‘Transferring findings into future actions’.

E. A strategic direction

1) Thinking holistically: results of topic related discussion on strategic directions

Integrated urban water management in an area like Wilhelmsburg faces many local challenges due to a variety of special conditions. Social, environmental and economic issues need to be considered carefully to find a sensitive balance. As it can be seen from the above a variety of demands which in part contrast each other need to be considered. For Further improvements to achieve further improvements towards a sustainable management of water bodies in Wilhelmsburg the following aspects are of main importance (highlighted phrases). These together form strategic directions for an integrated water management in Wilhelmsburg in the future.

Strategic directions:

The following aspects were identified as to be addressed to improve an integrated approach of an urban water management:

The lack of consistency regarding the work about water management should be encountered. There are many different projects going on but the interconnection of efforts is felt to be missing. The management of this work and exchange of information need to be improved.

Concerning education and information new paths of communication need to be identified and should be used more effectively. The interconnection of existing networks should be used for an improved exchange of information regarding water related issues.

Further investigations need to be undertaken to clarify the influence of water causing problems in developed areas. Besides this, small scale analysis to investigate impacts resulting from alterations of the state of the art of the management of water levels need to be undertaken. This enhances the likelihood of feasibility and would encounter and overcome restraints.

Design, shape and develop measurements to enforce specific recreational activities where wanted and to provide areas for conservation where needed. The aim is to create "Watersites". These sites could evoke a drawing power for recreational demands.

Conduct training and provide information to be used for education especially in schools and associations. Children are very important for the improvement of the acquaintance of water bodies in Wilhelmsburg.

Determine intensity of recreational uses and the state of conservation equally. Determinations should be met for every water body individually. Generalisations should be avoided.

The function of drainage and irrigation through water bodies in Wilhelmsburg needs to be considered carefully and is of superior importance. This is of major concern especially regarding changes such as climate variations in terms of rising number and intensity of storm water occurrences and provides the livelihood of the river island.

An ongoing facilitation and discussion of water related issues is important. A group of central players should keep the discussion on water related issues ongoing by enforcing actions towards an improved integrated urban water management.

Develop pilot projects to create examples for best management practices. These projects should reflect the results of the discussion and should meet all demands by ensuring functionality and ecologic qualities of the unique water bodies in Wilhelmsburg.

2) Transferring findings into future actions

After a five year period the switch-project is coming to an end. The question of how the discussions as such and their results can be implemented into Wilhelmsburgs' everyday life was raised.

It was proposed to transport the discussed aspects to convert them into realisable project ideas within a further step. These projects should reflect the idea of integrating and separating recreation and conservation. The ideas should then be presented to discuss the possibilities of funding. Therefore consultation of politicians and other representatives of the municipality should be a subsequent action.

Initiatives:

- HCU, the company WasserLand and other key stakeholders are working on raising funds to realize the ideas of the concept 'Wasserkulturförderung'.
- HCU, SAGA GWG and 'Wasserverband Wilhelmsburger Osten' will meet representatives of IGS to discuss the possibilities of funding and realisation of some of the developed projects ideas.
- ***HCU is already collaborating with the municipality on a project called RISA. This project concentrates on the possibilities and challenges of a decentralized storm water management in urban planning. This project can be seen as a direct follow-up initiative of the SWITCH-work in Hamburg***

February, 16th is a suitable date to present ideas on integrated urban water management. This day is for remembrance of the storm flood in 1962 where many people in Wilhelmsburg died.

Only an integrated urban water management is suitable to meet different and concurring demands with respect to changing conditions in the future.

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