

Guideline on detailed revitalisation principles

Project REURIS

(REvitalisation of Urban RIver Spaces)



1. Introduction

1.1 *Process of preparation of principles of revitalisation*

During the year 2009 a document General principles of revitalisation was prepared. The emphasis was placed on the social, economical and ecological aspects. This document was proposed and consulted with all project partners, their experts and members of consultation groups which were created within project REURIS.

Some of these principals are close connected to each other and it is not possible to use them separately. The project partners use these principles in their local studies and preparation of pilot actions and of course within all other projects in the future.

The principles of revitalisation are supposed to help planners, decision-makers, executing authorities and stakeholders consider the wide range of aspects (ecological, economic, social) with regard to the particular requirements of river revitalisation in an urbanised environment

1.2 *More detaiedl description of four basic groups of principles of revitalisation*

General principles for the revitalisation of watercourses in an urbanised environment

In the urban environment, rivers and streams must primarily have sufficient capacity to provide adequate flood protection to developments where buildings and structures are located. In most cases, stream channels in urban areas must also be stable, as there is not much room for rivers to develop spontaneously.

In earlier times, these requirements were mainly satisfied by technically designed water management structures. In cities and towns, geometrically regular stream channels reinforced with paving stones and similar structures were built. From an environmental standpoint, though, these riverbeds are extremely degraded, often look bad and do little to enrich the urban space with opportunities for residents to visit, relax and enjoy recreation. Due to the limited space for revitalising stream channels and flood plains in developed areas where conditions are not as diverse and where proposed measures can pursue various goals, each implemented project is essentially unique. Yet it should always fulfil or combine the objectives listed below.



View of a regulated section of the Úslava in Pilsen-Lobzy and the original natural section of the Úslava in Pilsen-Koterov. (Foto: ÚKRMP, Ing. Jan Hajšman)

The four main goals are to:

1. 2. 1. Enhance the ecological functionality of the watercourse as an ecosystem

To achieve the ecological functionality of the watercourse, it is necessary that the morphological condition of the watercourse be favourable. This is mainly characterised by a naturally large scope in terms of space and naturally high anatomical and hydraulic differences in the terrain. In terms of the ecological condition of the watercourse, hydraulic differences in the terrain during regular and low rates of flow are important. Differences in elevation are also important for wildlife and plants dependent on the water environment, as it allows them to remain and survive during floods. Reducing the longitudinal slope of the watercourse and the elevation diversity of the water column in the watercourse has a positive impact not only on balanced flow and sediment movements, but also on the self-cleaning process of the watercourse. Even in periods of minimal flows, the morphologically diverse stream channel (as opposed to a smoothly finished and prismatic stream channel) retains its water management and ecological functions as summarised in the following points:



Revitalisation of the Botič on the Kozinovo bank in Prague (Foto: Ing. Jiří Karnecki)

1. 2. 2. Provide flood protection

Drainage conditions at higher elevations along the watercourse always determine the flood prevention measures in the given territory. Coupled with soil amelioration, straightened, high-capacity and senselessly fenced-off river and stream beds which prevent them from naturally spilling into the open country in forests and meadows thus accelerates water drainage from the land and causes flood damage in built-up areas. In large urban agglomerations there is also the phenomena of buildings, various backfill and hard-top areas that further aggravate drainage conditions. These facts then lead to the following points:



Opening of the Litovice-Šárka stream by the Hvězda game reserve in Prague (Foto: Ing. Jiří Karnecki)

1. 2. 3. Increase the residential and recreational value

When carrying out revitalisation in urban areas, the individuality and variability of the stream channel along the route is an important requirement. Revitalisation attempts to create topographical differences in the new stream channel to the greatest extent possible. A multi-functional concept for the watercourse space is an essential requirement. The revitalised stream channel should feature as many sections as possible whose functions are valuable for the environment, visits and recreation. Modern approaches to revitalisation are mindful of making sure watercourse areas in and around municipalities are used to the best possible extent as a space for nature, recreation and relaxation for residents. This idea can be described in the following points: close-to-nature shapes of the stream bed or stream channel and bank; creation of suitable combinations of close-to-nature areas and areas and facilities for non-disruptive recreation, relaxation and sports activities; close-to-nature areas appropriately linked to the public park and garden system; the entire area being sufficiently unobstructed for pedestrians and cyclists, with publicly accessible and passable areas having priority over exclusive areas; good access to watercourses and water surfaces in the flood plain in those areas that should be accessible; on the other hand, areas that are intentionally inaccessible and quiet areas protecting the natural value of the area could be a part of the watercourse area; the watercourse area is attractive, uneven and interesting; various artefacts, attractions and installations can enhance the appeal of the site.



Renewal of the Mill Race in the centre of Pilsen (Foto: ÚKRMP)

1. 2. 4. Allow the permanently sustainable use of watercourses and their alluvial plains

Watercourses, ponds, wetlands and springs are not just a source of water, but always strongly interconnected yet vulnerable ecosystems. The water in the landscape is an irreplaceable natural wealth that determines the diversity of forms and species as well as the ecological stability of the land. In all its forms, water is also a major aesthetic element and factor determining the appearance of the landscape. Not long ago, though, landscape water management had little respect for its importance. This is the reason behind the efforts being taken to positively impact landscape water management, with the aim of maintaining natural conditions for the life of water and wetland ecosystems while retaining the natural character and close-to-nature appearance of watercourses, water surfaces and wetlands. The same attention is also paid to other approaches to landscape protection that are directly related to the protection of water.

River basin plans usually set general goals for the management of surface and underground water, the protection and improvement of surface and underground water and water ecosystems, the sustainable use of these waters, protection against the hazardous effects of this water, the

improvement of the water situation and protection of the ecological stability of the landscape. River basin plans also define the framework for necessary measures to assert public interests and international commitments, including resources and the method for financing these measures.

2. Principles of revitalisation in practices

Brief description of pilot action

Katowice

Pilot investment area is situated in a settlement inhabited by over 20,000 people, but there wasn't as yet a park space. The aim of the pilot was ecological restoration of c.a. 400 m stretch of river valley, combined with establishment of public space. Riparian habitats and elements of natural landscape were restored. Several dozen of native plant species were introduced and in the same time invasive plant species were eliminated. A wetland area was created using the old bed of the river. Retention capacity for stormwater was increased. Some sections of the river were renovated through replacement of concrete blocks with bioengineering structures. Public access to the area was ensured including footpaths, descent into the valley, footbridges, small architecture, resting places. Thus, safe recreational spaces were created without sealing the area and without any "hard" infrastructure, and the possibility for complete restoration of the Slep Piotka corridor was demonstrated.

Bydgoszcz

The pilot investment comprises a small part of the Old Canal with its surrounding area (circa 3 ha).

During its heyday the park along the Old Canal used to be a favorite vacation destination for the inhabitants of Bydgoszcz. After filling up the Old Canal and the gradual loss of its importance as an inland waterway route, the park became gradually degraded as well. In areas of the park further away from the centre of the city, nature took over in a positive way - many valuable plant communities emerged and the park acquired the new role as wildlife asylum in the dense urban fabric.

The pilot action in Bydgoszcz included developing the programme and spatial development concept for the entire area of the park (65 ha) defining the directions of its revitalization and developing the technical design for the part (less than 3 ha) for the implementation of the pilot investment.

The result of the pilot investment was creating the space with new aesthetics, that gives people the opportunity to spend their leisure time there. However all the activities were carried out with the view to restoring the former significance of the Park along the Old Canal.

The Bydgoszcz Canal is a relic of hydro-technical thought, unlike any in the world. It would seem surprising then that this "Wonder of 18th Century Technology" would not receive attention. The canal was a long awaited "child" of king Frederick II of Prussia, whose order started the construction in spring of 1773 and it was opened in 1774. The Bydgoszcz Canal gained a lot of importance with the appearance of the first steamboats on the canal, in the fifties of the XIX century. In the last years before the World War I a construction of a new line of the canal began, using the newest solutions in hydrology, which allowed even the

biggest of canal boats to get through. At that time, the old canal had already become a hub of social life. Both the local people and the tourist looking for some peace, a place to rest or a bit of fun would come to the water gates. Numerous restaurants and cafes as well as other attractions awaited them there. The most popular were the restaurants further west down the Old Bydgoszcz Canal, near gates IV and V – such as Kleinert’s garden, Kruger’s restaurant, or Blumenschluse – “Flower Gate”, set near the V gate in 1838.

Restoring the importance of the Old Canal area with the nearby Park plays an important role in keeping the city sustainable and at the same time returning the identity to the city inhabitants. Nevertheless, the success of returning the Canal value lies in preserving its historical value and highlighting the remaining elements of the historic spatial composition are concerned. New plantings of shrubs, trees and perennials introduced biodiversity on the area as besides the old trees it lacked valuable nature assets.

The new development of the land provided the opportunity for leisure activities. New elements comprise: seat slopes, terrain stairs, paths, ramps, footbridges over the canal, chess players’ square, benches, lighting, trash bins, bike stands etc.

As an additional investment that was added to the Central Europe Programme pilot, the playground was build with the municipal funds in order to bring the citizens to the canal and park area.



Pilot investment in Bydgoszcz – concept design 2010 (3 ha)



Park along Old Canal in Bydgoszcz – concept design 2010 (65 ha)

Brno

The plans for revitalisation in Brno concentrate on the Old Ponávka and its potential to build a new blue-green axis through the urban structure of Brno. The 3,7 km long stream is the only preserved raceway in close vicinity of the historic city centre connecting the main Brno rivers Svitava and Svatka. In order to pursue the objective of a blue-green axis through the city a Complex Revitalization Study of Old Ponávka has been processed as a base for further planning and implementation. The vision for the whole stream focuses especially on its integration into the city structure, combining the ecological revitalisation with the development of public green spaces for pedestrians as well as cyclists and access to river banks. Three particular sections of the river in Teplárny, Škrobárny, and Komárov show the biggest potential for realisation. Thus, for these particular projects documentations for land-use decision have already been prepared proposing detailed revitalisation measures.

Pilsen

The pilot action is situated in Bozkov Island belong the Úslava river. Bozkov Island represents an area with great potential for sport and recreation linked to the cycling paths along the river Úslava. A detailed land-use study proposes an architectural and landscaping solution that would extend and enhance the sport facilities including a water playground. At the same time, it would maintain the natural and landscape value of this unique space (a landscape park with meadows intended for recreation and access to the river are envisaged), while respecting the natural flood zone. The study will also assess the possibility of relieving the mill race during floods by means of a bypass canal running across the island back to the river Úslava. This would make the site more attractive and protect the current and future sport facilities from frequent flooding.



Stuttgart

Located between the urban district Freiberg with its high-rise buildings and the rather rural residential area Zazenhausen the abandonment of a former sports field provided the opportunity to revitalise the Feuerbach Stream, to redesign the topography and to renew the landscape scenery. The focus was on ecological restoration: The paved river banks of the Feuerbach were removed, the stream course was transferred to the middle of the floodplain. Meander zones, shallow water areas, undercut and slip-off slopes and deadwood enhance the biodiversity by creating habitats including a diversity of local conditions. A near-natural flood channel discharges high run-offs in case of heavy rains. The bank revetments differ corresponding to the special requirements with regard to flood protection in urban areas. Mainly bio-engineering measures were applied. Social issues were considered as well: the inhabitants will come across an attractive landscape for recreation, strolling and cycling.

Additional Note: The revitalisation of the former sports field is funded by various sources (REURIS, other co-financing, municipal means). Therefore, the REURIS pilot investment is only one part of a more comprehensive investment. However, consideration of the application of principles and experiences makes only sense for the total area as the parts are closely related to each other. Therefore, all descriptions and explanations in this document relate to the total area.



Pilot investment in Stuttgart – Plan of execution (total area), December 2011

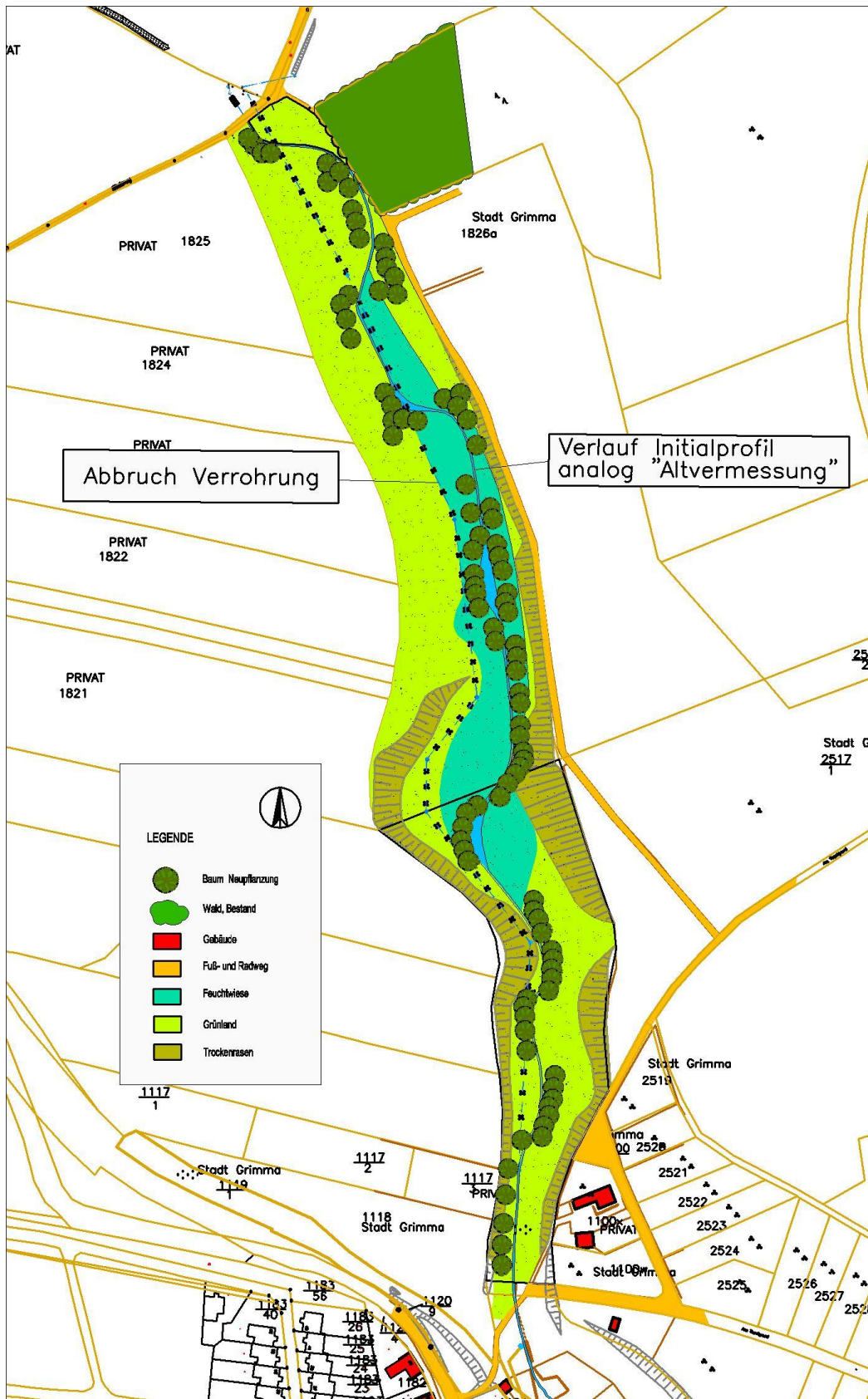
Leipzig

First ideas for revitalization and creation of the creek Thostbach and the surrounding area already existed since 1992. They are focused on the opening of the piped creek passages, on improving the ecological situation, on restoration of the surrounding wetlands, on improvement of flood protection for the city of Grimma and on designing of open space for the public. The pilot action within the project investment is one part of the concept of revitalization of the urban river network of the city Grimma. The stream was re-opened and revitalised again and hence the natural retention was restored. It was foreseen, to open and re-naturalise the river in the area of its natural river route. In addition new retention basins are created.

The revitalisation of the Thostgrundbach is an example of relatively short, but precipitously running off bodies of water in the urban space of a bigger river under the aspects of the special flood control and the possible biotope group, as well as his microclimatic, social and town planning effects.

The Thostgrund revitalisation implemented under REURIS project represents the first of three construction stages. According to the status of approval at the end of 2011 about 35 percent of the piped stream were subject to the re-naturalisation. Concrete tubes were demolished, the river bed was raised and relocated, additional retention areas constructed. In a second step further 30 percent in the upper Thostgrund were opened

As a result 65 percent of the stream is substantially re-naturalized. Revitalisation work on the remaining low Thostgrund, however, includes necessary changes in city's traffic planning and is thus a long-term goal.



*Pilot investment in Grimma – Plan of execution (total area), September 2011
Three construction sections proposed in the executive planning – First realized construction section realized and financed within REURIS project.*

3. How did project partner apply four basic groups of principles in practice within pilot action?

Katowice

1. Ecological function of the watercourse as an ecosystem

In the 70s the Ślepiotka channel had been displaced within the floodplain. The new channel was oversized; the banks and partially the bottom were paved with concrete blocks. The old channel lost hydraulic connection to the river. The floodplain was used for illegal landfill with waste from construction places located in vicinities of the valley. For decades the area remained abandoned.

Several dozen tons of rubbish and rubble were removed and replaced by peat soil, and invasive plant cover (especially *Reynoutria japonica* and *Solidago canadense*) was eradicated over an area of more than one ha. On a total length of more than 200m of the channel banks concrete blocks were replaced by stone, wood, and plants. A stretch of 50m of the old channel was restored as wetland for rainwater retention and habitat creation.

The enhancement of habitats like riparian forest, dry-ground forest, and flowery meadow was demonstrated. For this, a dozen thousand of seedlings of numerous native perennial plant species were reintroduced on the area of c.a. 3 ha. An orchard native forms of fruit trees and shrubs was also arranged. The valley slope was prevented from erosion through implementation of bioengineering methods, with use of native plant species.

2. Improving flood protection

The channelisation of the Ślepiotka aimed at reducing the flood risk for the adjacent areas but as a consequence the problem was simply displaced downstream. The implementation of the pilot action included the extension of the space for water retention in the Ślepiotka valley, through partial restoration of the old channel, as well as the increase of water infiltration capacity into the ground. Local flood events, which can take place in case of heavy rain, are The land use forms of floodplain, established through pilot investment, make the area resistant to the effects of river flood.

3. Increasing the leisure, cultural and recreational value

It is only in the scale of a neighborhood park space. At the same time it is the first in the region such as urban recreational space that has been created by creating or enhancing natural habitats typical of the river valley. Network of footpaths, walkways, rest areas, and an amphitheater, gazebo, bonfires are built into the semi-natural scenery. The area is accessible to people of all ages and for people with reduced mobility. The system tracks inside and outside the ground is matched to the planned expansion of cycling and walking paths in the city scale.

The site of a former landfill has been decorated wild meadow. Places to descend into the valley and bridge walks were installed in places where people already go a makeshift device. The traditional varieties of fruit trees and shrubs, formerly cultivated in the area, was established orchard. The content of educational boards helps the user in understanding what was natural landscape of the valley and what is the similarity of the solutions to the natural

landscape. Local schools and cultural institutions conduct their fieldwork in the amphitheater and on the nature trail.

4. Sustainable use of watercourses and flood plains

Revitalisation of the area in the context of REURIS restored the ecological and social functionality of river valley as a fragment of blue-green urban corridor.

Flood plain is designed as public space for nature and recreation, but also as a flood area.

The territory is categorised as aimed at the improvement of soil, landscape and habitats.

Local landowners and other stakeholders fully appreciate the project. They were involved during the planning & implementation process, and during first period of maintaining (e.g. removal of invasive plants, prevention from vandalism).

The maintenance of the area is accomplished by City Department of Urban Green, and the management system is agreed by the Regional Board for Drainage and Water Facilities.

Bydgoszcz

1. Ecological function of the watercourse as an ecosystem

The area of investment in Bydgoszcz is located in the city centre and the watercourse is of anthropogenic origin. The project pilot underwent a thorough reconstruction of green spaces in order to integrate biodiversity there. Species recognized as invasive in this area, hindering the development of native species were removed (boxelder maple and robinia) and plantings of native trees were introduced. In addition to trees and shrubs introduced extensive perennial multi-species, were planted (over 1000 sq ft), whose task, in addition to enriching the vegetation was to soften the waterfront. The plantings consisted mostly of an ornamental horticulture and not only of species native to the area.

2. Improving flood protection

No flood protection arrangements were implemented.

3. Increasing the leisure, cultural and recreational value

The investment pilot, along with the playground that was built there completely changed the face of the formerly degraded park. In the case of the pilot in Bydgoszcz, the most important issue was the restoration of the former importance of this part of the park and providing the users with the access to the water (and to the area) together with the recreational opportunities. Prior to the implementation of the pilot, the area only served as the rapid communication channel from the town centre to the further parts of the park. Nobody stopped longer than it was necessary in the area as the goal was to move through this section of the park. The result is the new quality of the revitalized area which results in its extensive use on the daily basis. In addition, the area has been annually used for events related to the Old Bydgoszcz Canal and local festivals, bringing together thousands of people.

4. Sustainable use of watercourses and flood plains

All activities were carried out with the participation of beneficiaries in the process of changes in the pilot. It aimed at the involvement of the local community such as institutions being

close to the area. The involvement of participants allowed for their identification with the place which they recognized it as "their" own, serving the benefit of all. Such participation and involvement activities have the potential to result in the increased integration of local communities, their care for the land, reducing vandalism and finally the belief in the good results of the correct process of revitalization.

Brno

1. Ecological function of the watercourse as an ecosystem

Present hydrological conditions will be diversified using natural elements such as stones. In suitable sections will be placed parts with faster water velocity. This imitates natural longitudinal diversity of streams. This division into slower and faster sections will be apparent during lower flow rates only. Concrete pavements and other kinds of river bank stabilization will be modified into more nature-like state using mostly natural stones. To increase the ecological value of the stream will be removed total of 472 m of roofing. In the stream itself will be created different types of habitats e.g. habitat of slow shallow waters, nesting opportunities in joint spaces of banks stoning, habitats for various species in reed vegetation and others. In wider river surroundings will be planted indigenous species of trees and shrubs. With increased biological activity of the stream will be raised also self-purifying ability of the water. The quality of the water will be partly improved also with alternative tracing of the stream in order to avoid waste water pollution in this part of the stream.

2. Improving flood protection

No flood protection arrangements are going to be implemented. The proposed flood protection measures on Svratka River are respected.

3. Increasing the leisure, cultural and recreational value

The importance of Ponávka in the city's image is highlighted by increasing visibility, attractiveness and accessibility of the stream. Pedestrians are invited to walk along the stream; also other ways of unmotorized transportation are promoted. Visitors should be able to come down to the water level on several spots, however they cannot be invited to enjoy the water itself as it has poor quality. On suitable spaces is proposed placing street furniture and short time recreation facilities (benches, refreshment points, playgrounds or just free spaces). Educational aspect of the project will be fulfilled with installing educational panels along the stream. This educational path will provide visitors with information about history of Ponávka River, former state and proposed arrangements. Visitors will be confronted with several different characters of greenery varying from civilised to wild-like. There is counted also with creation of places suitable for artefacts however the character of the artefacts is not specified in the study.

4. Sustainable use of watercourses and flood plains

In order to fulfil expectations of experts and public, both these groups (including students) have been encouraged to cooperate during works on the study. Appearance and function of

the proposals have been discussed on the expert level and then presented to the public to get feedback from future users of this public space.

To avoid conflict between new boulevard and Ponávka River tracing of the river have been modified in some parts.

Pilsen

1. Ecological function of the watercourse as an ecosystem

Regular flows will run through a narrow, shallow stream channel (bed) formed in the bottom of the berm. The bed will feature diverse forms, with flow pools and broken, uneven cross-sections and longitudinal sections. The landscaping of the banks will be diverse in terms of the degree and method of stabilisation and accompanying vegetation. Sections with a higher degree of landscaping (park landscaping, play areas) will alternate with natural and ecologically stabilising sections. The water depth will range between 20 and 50 centimetres.

The upper and lower section will be natural in character, especially in sections that link up with existing watercourses and bank vegetation. The bed will be shaped so that it will provide conditions for natural littoral vegetation growth in the form reed plants. The vegetation will have a generally natural character and require a low degree of maintenance; the final state will correspond to a full-fledged element in the territorial system of ecological stability (TSES). It will provide habitats for organisms linked to biotopes with flowing and standing water. In instances of low flows, it will provide conditions for the survival of aquatic animals.

2. Improving flood protection

The new terrace and drainage canal between the original mill race and the Úslava River on Božkov Island has been designed to adequately contribute to protecting the built-up parts of the island against flooding. Based on the character of the land, the way in which it is used and its position in a flood, the required level for protecting the northwestern section of the island against five-year floods (Q5 on the Úslava) was set. In addition to this requirement, another function for the broad-base terrace was defined – especially its recreational use and ecological function.

In terms of appearance, the terrace will be a broad and shallow channel with changing slope inclines. Between 15 and 32 metres wide, the broad-base terrace will feature a composite and changing cross-section. The terrace is 220 metres long. The upper part of the cross-section (berm) has a cupped shape with a flat bottom. The depth of the berm is 0.8 – 1.8 metres below the current terrain level. The longitudinal slope has been set at a constant value of 0.47%. The flow cross-section of the berm will carry flood flows between the mill race and the Úslava channel.

3. Increasing the leisure, cultural and recreational value

The central section of the broad-base terrace will be landscaped with regard to its primary recreational function – a children's water playground. The bottom of the berm will be technically adapted to accommodate intensive movement and visitors. Smaller seating and relaxation areas will also be created on the terrace. It will not be possible for benches to be installed on the terrace; instead, low stone walls, terracing of the berm slope or anchored wooden elements will serve as seating.

The banks of the watercourse in the bed will be locally adapted and technically tailored so that play elements can be installed. These play elements make use of the water environment and allow children to come into immediate contact with and handle water. These elements are mainly

mechanical moving elements (water wheel, mills, lever beams and sluice gates), stepping elements that allow one to cross the watercourse to the other bank, and areas that are adapted to allow children to wade in shallow water.

A selection will be made from the assortment of play elements manufactured by companies whose quality has been proven (such as Richter Spielgerate GmbH and EIBE). These products are highly resistant, are made of stainless steel or wood, and have been verified through many years of use, especially at playgrounds in other countries. The products are certified and comply with European technical standards. The water playground will be used in season (approximately from May till September). Some parts can be disassembled during the off-season. All elements must be adapted and installed so that they would not create a significant barrier to flowing water, prevent the terrace from performing its function of providing protection from flooding or damage the flowing water.

4. Sustainable use of watercourses and flood plains

The location of the sports and recreation facility and nature park is on Božkov Island, which is cut off by an old mill race in the Úslava flood plain. The broader territory is a part of a biocorridor of regional importance on the Úslava River, RK 2010, which is included in Pilsen's territorial system of ecological stability.

The broader territory is a part of the sports and recreational paths (greenways) in Pilsen's river valleys. Its use as a sports and recreational centre and nature park was established in the studies:

"Study Revitalisation of Pilsen's river valleys – Úslava" (ÚKRMP)

"Study - Božkov Island" (AS Hysek s.r.o., 12/2009)

"Study – Vegetation changes on Božkov Island" (GeoVision s.r.o., 06/2010)

"Study the new terrace and drainage canal – Božkov Island" (Ateliér Fontes s.r.o. 10/2010)

"Study 2D flood model - Božkov Island" (DHI, a.s., 10/2010)

Within the local biocentre, the borders of which had to be specified in detail according to the newly considered traffic conditions (bicycle trails, access routes to the river, placement of other sports areas), the most important compensation measures were aimed at the loss of natural habitats at the expense of new hardened surfaces, i.e. primarily compensation for the in-line skating track and new bicycle trails leading through compositional sections of the territorial system of ecological stability (biocentre, biocorridors). Furthermore, the compensation measures include the growth in visitors to the regional biocorridor in terms of the increase in sports and recreational activities (water games, football pitches, rope climbing centre, meadow for spending leisure time, numerous new walking trails). The proposed compensation measures primarily included planting new trees and shrubs and creating close-to-nature water and wetland sites on the new flow terrace.

Stuttgart

1. Ecological function of the watercourse as an ecosystem

In the 1930s the Feuerbach had been channelled, its banks paved with steep slopes, the floodplain used for the construction of a sports field. The revitalisation of the area in the context of REURIS restored the ecological functionality as alluvial plain and module of the biotope network axis, which had been lost to a great extent.

The pavements were demolished and replaced by natural substrates thus improving habitat quality and migration permeability for aquatic animals, which now are enabled to indwell and

transmigrate this section of the stream. The stream bed is mainly secured by bio-engineering measures and - where necessary – by water stones. The meandering course now features the possibility to develop diverse habitats by dynamic and natural processes such as shallow and deep water zones, undercut banks and slip-off slopes. The sealing of the soil surface in the drainage basin by extensive settlement areas leads to rapidly rising run-offs in case of heavy rain. Therefore, in order to avoid aquatic animals to be washed away and enable them to develop constantly an additional naturally modelled flood channel was built. Wetland biotopes, areas for succession, indigenous bushes and trees complete the new alluvial landscape.

2. Improving flood protection

The channelisation of the Feuerbach in the 1930s had aimed at reducing the flood risk for the adjacent areas but as a consequence the problem was simply displaced downstream. Additionally, the sealing of the soil surface in the drainage basin during the last decades lead to an again rising flood risk. The implementation of the pilot action included the extension of the space dedicated to the stream and the excavation of the area thereby enhancing the retention capacity to some extent. Paved surfaces (former stream bed, parking lot, sports field) were replaced by natural soil and bio-engineering measures or – where necessary - by water stones thus improving the infiltration of storm water. The meandering course and the coarseness of the stream bed and of the flood channel slow down the flow speed.

3. Increasing the leisure, cultural and recreational value

As the pilot action area is located at the fringe of Stuttgart in an area of high importance for nature conservation the focus was on ecological restoration. Recreational facilities will be confined to a small place (realisation to a future date next to the REURIS pilot action area on municipal ground). Nevertheless, the remodelled scenery increases the quality of recreation in a near-natural surrounding. It enables inhabitants to enjoy quiet and relaxation in a calm neighbourhood. A new combined path for cyclists and strollers allows people to experience the landscape and water course. Furthermore, the area adds to the network of open spaces and green axis in Stuttgart.

4. Sustainable use of watercourses and flood plains

The pilot action refers to the landscape and land use plan, which categorise the territory as “area aimed at the development of soil, nature and landscape” and set the objective to strengthen the natural functions, to improve landscape scenery and habitats. Additionally, most of the valley is designated as flood area. These dedications ensure that the pilot action area is allowed to naturally and sustainably develop. People were involved during the planning and implementation process and expressed their appreciation of the project, which helps to avoid vandalism after implementation. Steps of implementation were announced in the press, guided tours were offered during construction. The maintenance of the area will be accomplished by the Department of Gardens, Cemeteries and Forests (area) and the Department of Civil Engineering (waterbody).

Leipzig

1. Ecological function of the watercourse as an ecosystem

In the crowded area of north-west Europe, waterways, as linear elements, are often the sole connecting corridors in the biotope network for natural, native flora and fauna. The limited usability of space immediately surrounding water (water logging/embankments/trenches) is the basis for the remaining natural biotopes. For the preservation and regeneration of natural biotopes as a basis for human development, revitalisation of water bodies is the most important issue of our time! Through the Thostgrund stream water outlet and the aim of developing this as a nearly natural meadow stream with equally valuable herbaceous biotopes on the banks and its preservation, a small but important contribution will be achieved.

2. Improving flood protection

With the restoration of the river section of the Thostgrund in conjunction with the creation of optimised rainwater retention basins, flood protection for local areas and the Mulde river can be achieved. With a "simple" revitalisation of the water sections of the Thostgrund, only limited flood protection can be achieved for the local waterbodies and the Mulde river as the principal water body. But considering the fact that here in the central and upper reaches more than a thousand such small waterbodies converge in the valley, there is significant potential here.

3. Increasing the leisure, cultural and recreational value

Through the implementation of the pilot scheme on the Thostgrund stream, first steps towards the improvement of local outdoor, leisure and recreation facilities without technical infrastructure are being achieved. The project promotes the creation of an attractive landscape with streams and springs. Creation of accessibility to natural habitats, creation of space for inhabitants, development of a green axis. Better connection of the surrounding urban districts of Rappenberg, Hohnstädt, Grimma West and the city centre to the "green lungs", thereby improving the local environment.

4. Sustainable use of watercourses and flood plains

The project for the revitalisation of the Thostgrund stream with its increase in terrain area could only take place by simultaneously discontinuing the commercial use of the stream meadow. The stream valley will be mowed once or twice a year by the Landschaftspflegeverband, taking the natural water dynamics into account, in order to preserve the character of the Wiesenbachtal along with the important cold air supply function for the historic district of Grimma. From the perspective of biotope value, the wild herbaceous stream meadow will create a biotope that is as valuable as the genuine natural riverside mountain forest.

4. Recommendations regarding experience with maintenance of the newly established public spaces

Katowice

- Over time, there have become apparent the effects of the errors committed in the course of performing the bioengineering devices. Repair proved difficult to enforce. Conclusion - select contractors with proven achievements, not necessarily the cheapest, and then provide specialized supervision.. This is especially important if the action goes beyond the scope of existing state-of-the-art in the region.
- To eliminate methodological errors in the removal of invasive plants there appeared necessary to develop the instruction booklet for the service primarily responsible for the area. . Conclusion - the development of the "instruction manual" should be developed as early as during construction.
- Residents of adjacent land on its own initiative, take part in the monitoring of the object, try to prevent vandalism, report the observed errors in the maintenance facility, communicate negative random events, notify the demands of improvements, etc. Conclusion: social participation in the preparation and implementation of investment results in sensitization of local communities and in benefits at the stage of the maintenance.
- Costs incurred by the revitalized area proved to be individually less than for "typical" greenery; the reason is that this case the vegetation has gained sustainability features. Conclusion: the management of riparian plant cover in a manner consistent with the habitat conditions is viable from an economic point of view.
- There are acts of vandalism such as damaging of information boards and destruction of small architecture devices, but over time they are becoming rarer. Repair costs are low, because the restoration of equipment is very cheap. Conclusion: If we account for the vandalism, exploit the materials and construction of low-cost, easy to replace.
- Despite the obvious success in achieving and maintaining the revitalized space, the city does not declare their willingness to implement in the coming years, the activities for the next sections of the valley. Conclusion: If we can design and implement a pilot investment, but there is no guarantee of follow-up, let us choose the location and the size of the project, by itself, it has brought a significant improvement of public space of the city.

Bydgoszcz

The development plan was made based on a detailed analysis of the site, guidelines and consultative institutions and what is more in accordance with the expectations of the future users of the park. All the elements of development form coherent aesthetics. Overall implementation provides the ability to maintain the good results of revitalization, materials and structures are stable, but in the first year, a number of problems had to be solved successively:

- the project was completed in late autumn, so a lot of damage to winter greens required repairs in the following year, which has been performed successfully (though it is a frequent phenomenon with the new green spaces, especially in severe winter, in the first period of the spring),
- a big problem maintenance problem was also the weeded area, probably due to the soil that got the weed seeds during the construction works - now the problem is solved and after the additional plantings were done to replace those damaged by frost, mulching helps prevent the weeds,

- the land development with the use of slopes at an acute angle of inclination is maintained well, from the north the grass remains undamaged from the beginning (except for minor devastations that were leveled for example by means of planting thorny bushes that are difficult to break through in order to limit entry onto the slopes and causing the surface to slide down), but the slope on the south side required major repairs as a result of which, a new stormwater drainage system from the sidewalk to the watercourse was installed, which stopped the erosion of the banks. Intense sun leads to significant drying of the grass, which is gradually eliminated by the introduction of other drought-tolerant ground cover vegetation;
- the conservation office recommendation as to the use of glass elements on the REURIS area unfortunately gives way for repeated vandalism, repairs are carried out on a regular basis to maintain the safety of the users of the park, but in the future we are going to change the balustrade material into one that is less prone to damage.

5. Recommendations regarding common experience with pilot actions

Revitalisation of river space in brownfield area: poses particular challenges: The possible existence of contaminated sites has to be regarded, surveys should be carried out. Leftover installations have to be demolished and possibly be disposed. There is need of dealing with existing infrastructure.

- Take into account the need of surveys and possibly additional costs for disposal and possibly remediation of the area or for the transfer of infrastructure

Revitalisation in of river space in urban area

In an urban area the run-off characteristics of the original watercourse can have experienced major changes by a high and prospectively increasing degree of soil sealing in the basin.

- Analyse the hydraulic situation
- Analyse the need of flood protection
- Perform a hydraulic calculation
- Take climate change into account (increasing storm water run-offs or less flow rates in summer)
- If possible, start revitalisation of a river or stream from the upper reaches downstream. Otherwise, the current emerging from a paved stretch encountering the stronger coarseness of a restored stretch may educe strong erosive forces and require comprehensive pavements in the transition area..

Cooperation in a big administration

In a big administration with many departments involved and offices scattered in the city area planning and implementation takes time.

- Consider time-consuming processes when setting the timeline
- Consider ways of quicker flow of information (also through unofficial channels)
- Implement regular meetings
- Monitor and report the proceedings of planning and implementation regularly
- Fix up a binding time table

Ecological aspects

The consideration and implementation of ecological aspects in urban revitalisation projects requires sectoral knowledge.

- Involve planning experts
- Prioritise bio-engineering measures rather than technical solutions.
- Ensure that construction is supervised with respect to ecological issues so that the goals are met
- Ensure that the construction company is skilled to implement ecological functioning measures

Personal contacts

Personal contacts with affected people beyond the official can help to get support.

- Inform and involve people at an early stage
- Use direct ways to contact important stakeholders

- Make sure that people are aware of all aspects of the project, e.g. if technical solutions or unpopular measures are required that may not meet with the inhabitant's approval. Explain them in advance.

Permission procedure

Plan modifications during the planning process can cause substantial changes with the result that an update of the permission is required.

- Consider the need of a permission update
- Stay in contact with the permission authority

Financing

- Consider possible cost increase in advance and think about how to solve the problem in order to avoid delays in implementation (possible savings or additional sources). Factor enough funding to cover unforeseen obstacles.