

REPORT ON PILOT ACTION ON BROWNFIELD REMEDIATION IN RUDA ŚLĄSKA

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1. Introduction

The report is presenting the technical description and documentation of the rehabilitation of brownfield site in Ruda Śląska to create public space with recreational functions.

2. Technical description of the investment

The brownfield site located in the peri-urban northern part of the Wirek district covers the area of 6.5 ha. It is an anthropogenic elevation constructed from wastes reaching the height of maximum 293 m.a.s.l. and became one landmark in the area. The site is surrounded by dwelling houses, garages, workshops and a school building and on the east there is an underground coal mine. According to the Development Strategy of the City of Ruda Śląska this area should constitute an interface between service and administration functions of the city and be an initial part of the future peri-urban green infrastructure.

The investment framework includes the following:

- site assessment and public consultation (with interregional inputs) results,
- rehabilitation activities in order to stabilize soil pollution. The range of phytostabilization will be based on the present state of the 1 m thick soil layer covering the site. It is estimated that 30% of the area will need phytostabilization planting activities. The phytostabilization planting will be combined with greening the area with trees and bushes complementing the existing green cover in order to increase the aesthetic and practical values of the site,
- elements of “small architecture” (approx. 30 benches, 60 lamps),
- walking paths partially paved for biking - approx. length of 2000 m,
- 6 places for picnicking and barbeque.

The investment will cause the following effects:

- improvement of safety in the area by creating active frontages and monitoring,
- improving functionality, aesthetics and attractiveness of this place and its surroundings - that means increase of the life quality in the neighbouring settlement district,
- pilot project and landmark for the peri-urban green infrastructure in the peri-urban area and increase of the attractiveness of neighbouring areas for investments,
- stimulation of the walking and biking routes connecting the districts of Wirek and Nowy Bytom.



The investment implementation will create an available open space of a natural, “half-wild” character; due to the progressive greening it will achieve the character of a sub-regional park. The place will become the walking and biking route connection of two districts as key element of the peri-urban infrastructure. The investment will contribute to the project specific objective 2 as it will develop a site in the centre of the agglomeration into an area serving to inhabitants with regarding Environmental management requirements especially these concerning protecting human health against environmental hazards. It will meet the 3-rd specific objective since it contributes to protection of land resources by offering a recreational area inside the city counteracting tendencies to look for recreation places outside of the city. In Central Europe there are still many sites of a brownfield character. They constitute a significant problem occupying centres of cities in a situation of a shortage of free space other functions. Methods applied in the project will serve as examples of cost saving good practice for other entities tackling similar problems.

The most important will be showing that these land use barriers in form of brownfields in the cities centres can also offer a chance for development. The group benefitting from the investment will be the inhabitants of the district, the city and the whole region. They will take advantage of having an attractive place for recreation which also will create an alternative for public transportation offering shorter access to get to schools, work etc. The investment tackles the problem of sustainable management of sites located inside cities. They offer a potential which should be used for new social, Environmental and economic functions. We expect to achieve a good example of solving land-use conflict by rehabilitation of a degraded area into safe function useful for social needs.

3. Location of the investment

POLAND, Voivodship Śląskie

Address:

Between 1 Maja Street, Tolstoja Street, Kupiecka Street,

41-710 Ruda Śląska, Poland

GPS coordinates:

50° 16'41.0"N 18° 51'53.1"E

The site constitutes one of the elements of a wider project on public spaces system and clearing functional and Communication connections between central districts of the city. The investment is located in the district of Wirek in the very middle of the Ruda Śląska city. The site is of 6.5



hectares and it is surrounded by areas of different functions: dwelling houses, garages, school and an industrial site. The site will connect the wider planned walking- biking route from north to south.

The site was used as a dumping place for wastes from zinc smelter owned by Liebe-Hoffnung company whose operation in Ruda was terminated and the smelter was closed in 1925. The company does not exist as well. After the World War II as a result of nationalization the site was owned by the municipality (entailed by the State Treasury). Therefore the polluter pays principle is solved by taking the responsibility by the city. In 2009 investigations on the level of contamination have showed increased level of heavy metals. In 70-ties reclamation activities have been already implemented to cover the area with a soil layer 1 m thick. As the preparatory work of the investment the ground examinations will be made to assess the present exposure to Environmental hazards. There is a risk associated with no go decision as the investment will minimize the possible negative impact of heavy metals therefore the risk will be minimized by remediation actions implemented in the investment framework.

For the investment a concept has been worked out of the area development and arrangement. It has been done in the framework of an Integrated Project on Key Public Spaces Redevelopment in the Functional Urban Area of Chorzów, Ruda Śląska and Świętochłowice, co-funded by the Operational Programme in Silesia for 2007-2013. The concept has been developed basing on the results of the workshop at which inhabitants and other stakeholders participated. For investment implementation an exposure assessment will be made basing on the results of the ground examinations and the concept of phytostabilization technology which will constitute an element of the whole technical documentation. Then the building permission is necessary to start the operation. In order to achieve the results (regarding public procurement procedures) all the work will be started immediately after the project is open.

The site is located on the ground which is owned by the city. Part of the site is now under hereditary tenure of the mining company. The area is covered by the Local Land Use Plan of the City of Ruda Śląska (the resolution of the City Council from 22.06.2006). According to this plan the area is defined as: areas of arranged greenery with the function of parks, gardens, lawns. After the project end the area will be used as a city regional park offering recreational possibilities like walking, biking, winter sports like sledging etc. The maintenance of the area will be taken care of by the city owned company - Municipal Company of houses Management. It will ensure the durability of the investment as a regular park serving to the inhabitants.

Most of the surface of spoil heap area was covered by meadow of mixed herb plants and sparse woodlots. Majority of herb plants represent metallophyte species. All above the ground parts of

mentioned herbs were contaminated, that could bring health problems to people while having frequent skin contact with them. In northern part of the area there were sharp crags of height about 2-3 m, above them steep slopes bringing danger of falling down to space users. Some patches uncovered by plants had revealed rough spoil contaminated deposit. Partially there could be found boulders of parched slag with sharp edges. They were present on northern slopes and in woodlots.

There was a need to cut down dangerous crags, make even slopes and hide exposed parts of spoil heap material.

The design followed the results of above actions and contained listed below elements:

- remediation and phytostabilization of top layer of the spoil heap;
- northern slope and spoil heap top formation;
- road path system;
- lighting design;
- surveillance infrastructure design;
- recreation infrastructure: viewpoints, grill area, outdoor gym equipment, industrial playground, education path.

Phytostabilization design involves the reduction of the mobility of heavy metals in soil. That can be accomplished by decreasing wind-blown dust and minimizing of soil erosion according to creation of tight plant cover. Reducing contaminant solubility or bioavailability to the plants depends on pH level and presence of stabilizing substrate. The addition of soil amendments, such as brown coal, and alkalizing agents in form of lime fertilizers, can decrease solubility of metals in soil and minimize leaching to groundwater. Most of active chemical compounds of heavy metals are blocked this way and neutralized. The mobility of contaminants is reduced by the accumulation of contaminants by plant roots, absorption onto roots, or precipitation within the root zone.

To provide proper habitat for planned grasses there was designed addition of fertile soil to the top layer of the ground. There were chosen grass species especially suitable to limit contaminations in roots and restrain their migration to aboveground stems. Three species of grasses with diverse form varieties were used. They are *Lolium perenne* - rye grass, *Festuca rubra* - creeping red fescue and *Miscanthus giganteus* - giant miscanthus. According to some scientific research these grasses can grow on zinc spoil heap habitat and have very limited traces of heavy metals in leafs. Phytostabilizing area - 12 266 m², covering of northern slopes with clay and new soil area - 12 366 m², southern slope for gradual species exchange - 17 778 m².

Design in numbers:

Construction area - 63 735 m²

Northern slope for transformation - 12 366 m²

Remediated area with phytostabilization - 12 266 m²

Southern slope for gradual species exchange - 17 778 m²

Bicycle facilities for BMX - 2 071 m²

Path system - 4 387 m²

4. Design assumptions

Main problem and target of actions designed for area of zinc spoil heap in Ruda Śląska was the soil contamination and the process of the situation improving with remediation, to reach safe recreation open space. Additional targets were: to mitigate dangerous sharp and high crags on the northern heap edge; build possibly low cost in maintaining leisure infrastructure with possibly broad offer, vandalism resistible, and with deep connections with local identity and history.

5. Remediation

Remediation of topsoil in the concerned area was provided by phytostabilization on the top of spoil heap and covering northern slopes with clay and new soil layers. That should prevent inhabitants from the contact with dangerous substances. That was important especially on the top of spoil heap where the most of sport and leisure activities would occur. To protect people against heavy metals present in metallophyte plants they were replaced with proper safe species. Southern slope remained nearly untouched with minor activities provided. Nearly all designed activities are connected with northern and top area. For southern slope gradual exchange of plant species was planned and was realized by cutting grass before seed maturity and sowing target species of grasses, similar as for phytostabilization.

There were provided following actions and studies:

- social participation led by ARCA Studio - meeting with inhabitants of local community which gave range of expectations and propositions; prime conception plan for the area was developed as a result of meetings;
- mineralogical and chemical characteristics of the area done by prof. Iwona Jonczy from Silesian University of Technology, Gliwice;
- study of utility features of zinc spoil heap deposit done by CB Project and GIG Institute;

- plant cover studies led by specialists from Department of Biology and Environmental Protection, Silesian University, Katowice;
- various actions undertaken by municipality;
- greenery inventory of trees on the area dedicated for ground level changes;
- indication of metallophyte plants spots on the concerned area;
- analysis of application possible expectations of inhabitants.

6. Development elements

According to landform change the northern slope was transformed. Limited part was left untouched as the „essence of the place” - high crag with moss and grass plant cover, with matured birch tree and some outcrop of spoil heap material with slag sinters. Some information points of educational path connected with slag features and metallophyte plants are placed nearby. The slope has been planted with birches, oaks and ash trees in geometrical groups to support expression of manmade landscape, but with use of native trees. On the area of the northern edge there was designed Land Art made of hornbeam trees.

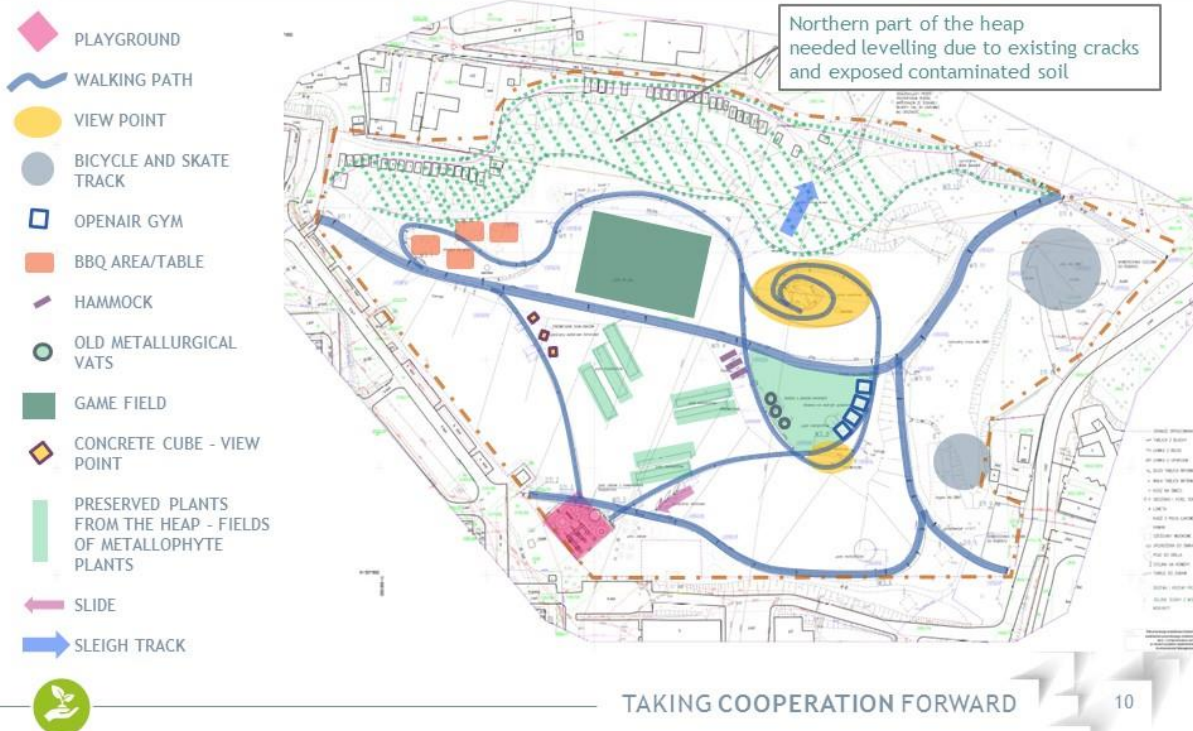
On the middle of the heap top there was designed a view point in form of a hill about 4 m high. That was made of spoil heap material and covered by clay, soil and sown by grass. There was installed lunette, some benches and educational path point. To the north of the view point there was designed a sledge slope. Other top area was flattened and treated with phytostabilization to neutralize heavy metals contamination. To the west of the view point there was located a playing field. It will be sown more densely than other places, and will be well maintained. Around the playing field there is a low dike with tube-tunnels for children play. Furthermore to the west there is situated the grill area under canopy of birches. Places for grill stands are in a form of gravel square pits surrounded by timber kerbs. Dark basalt gravel corresponds to zinc slag but is not contaminated. Stands for grill are separated by the dashed lines of miscanthus. That will give sense of intimacy providing kind of a green wall maze for children play.

By the centre of the area there was built a main path joining 1st Maja Street with "Trakt Rudzki" path. Near the western end, on the place where the path reaches top ground platform there are concrete hammocks. These constructions have timber cover suitable to sit on and handles to mount own hammock. Leaving hammock for days in open space could be not reasonable because of possible vandalism and high fall of furnaces dust which makes textile dirty, especially during rainfall. Quite near to them there are view concrete boxes with two deck chairs in each. Intimate space, with view outlined by edge of the box have boards of educational path To the south of the main path there are located three iron factory vats on the slag spot. Vats are filled with soil and

planted *Lycium barbarum* - boxthorn. That shrub has falling down branches, bright silver-green leafs and can symbolize liquid metal in high temperature. Around vats there are small basins with slag gravel and educational board with zinc and iron production technology. Next groups of hammocks are placed near vats. On the side path curve there is a second - "small" view point. Following that path one can find open space gym. There is either the place for boulder of zinc ore with educational board. Some additional hammocks stand there on the slope edge. On the east border there is a jumping track for BMX bicycles located in dean made of coal mine rock. Slopes of dean will be covered by clay and grass. Track path is covered by clay and lime gravel. The same surface is designed for BMX circus in the eastern border of the area. Circus has a form of round dike with ramps about 2m high, with walls suited to bike extreme rides and jumps. On the southern border there is another path going to a playground. Most of paths on the area are covered by gravel and lime stone dust. Only two paths leading from the top of spoil heap to playground are made of mineral-and-resin surface because of steep slope. They provide extreme steep for walking path to give expression of spoil heap height. Along one of those paths there is a line of slides for children play. On the main area of the playground there is a wooden construction in the form of industrial structure with some connotations to coal mine lift tower, drift or some iron and zinc factory dwellings. Additionally there are various slides and modern play equipment which may be associated with industry but giving the same time high quality play proposition. On the southern slope there are some spots of metallophyte plants left.

They create rhythms of rectangular forms or circles. Nearby there are educational boards put with information about that kind of plants. On the whole area there are boards of educational path with information about local history, industrial revolution, zinc production technology, features of spoil heap material, metallophyte plants, spontaneous flora, birds living around and area information system.

FUNCTION DIAGRAM



1. Development of project documentation

Time limit for completion: 10.11.2016 - 10.05.2017

Done till the end of the date 14.07.2017 and finalized by getting a building permission: 18.09.2017

2. Author's supervision

Time limit for completion: 10 months

3. Mineralogical characteristics

Time limit for completion: 24.05.2017 - 12.06.2017

4. Revitalization of the zinc heap

Time limit for completion: 13.12.2017 - 02.06.2018

- Cutting down trees colliding with the investment:
- Ground works, levelling north slope of the heap, forming of the view point and levelling top of the heap:
- works related to the implementation of underground technical infrastructure: lighting,
- monitoring
- Remediation of topsoil by using the phytostabilization method on the top of the spoil heap,
- covering northern slopes with clay and new soil layers.

5. Development of project documentation - pedestrian construction

Time limit for completion: 20.07.2018 - 30.09.2018

6. Pedestrian construction

Time limit for completion: 15.10.2018 - 30.11.2018

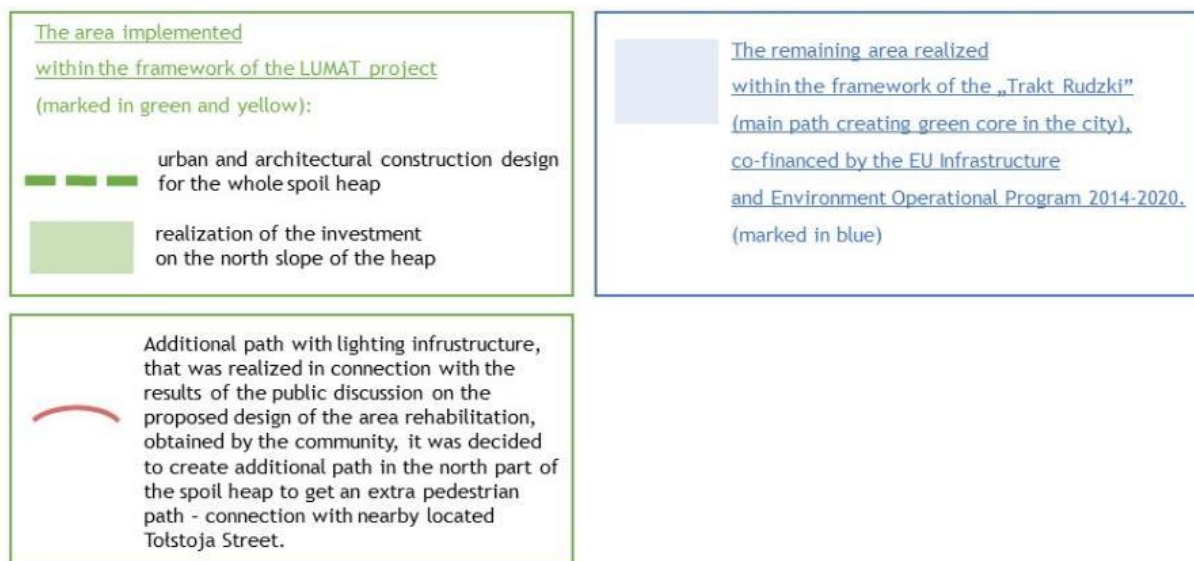
7. Execution along with the development of a set of climbing walls

Time limit for completion: 24.10.2018 - 30.11.2018, during that time the delivery of the foil LDPE under the climbing walls was made: 7.11.2018

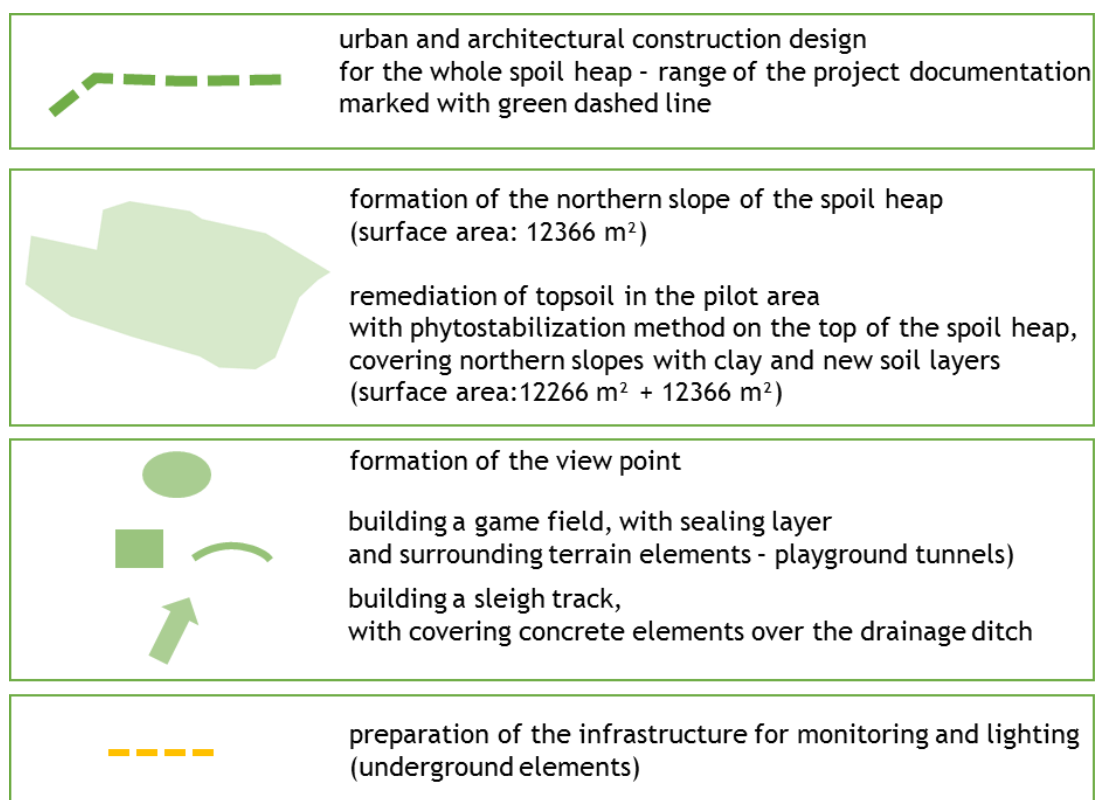
8. Delivery and installation of posts

Time limit for completion: 15.12.2018





The area implemented within the framework of the LUMAT project (marked in green and yellow):



Indicators achieved in the project LUMAT:

1. Length of the walking path - 293 m, area 880 m²
2. Green area by the path 361 m²
3. Lamps - 7

4. Area northern slope and view point - 12 366 m²
5. The area covered by phytostabilization - 4483 m² + 1755 m² + 664 m² + 1156 m² + 1801 m² + 2407 m² = 12 266 m²
6. A set of climbing walls - 1

Development of project documentation: Costs: 85 977,00 PLN brutto

Author's supervision: Costs: 5 580,00 PLN brutto

Mineralogical characteristics: Costs: 2 500,00 PLN brutto

Revitalization of the zinc heap: Costs: 525 210,00 PLN brutto

Development of project documentation - pedestrian construction: Costs: 24 477,00 PLN brutto

Pedestrian construction: Costs: 154 980,00 PLN brutto

Execution along with the development of a set of climbing walls: Costs: 153 012,00 PLN brutto

Delivery of the foil LDPE: Costs: 235,00 PLN brutto

Delivery and installation of posts: Costs: 1 512,90 PLN brutto

Total costs (mentioned above): 259 213,00 euro

Estimated co-financing ERDF: 220 331,05 euro

85 977 PLN (project documentation) + 6 200 PLN (author's supervision)

Total amount: 92 177 PLN

Estimated general costs of investment on the northern slope (within LUMAT funds): 850 424 PLN

The contract for the total revitalization of the pilot area (the north part of the spoil heap) within the LUMAT Project was signed for the total amount of 525 210 PLN.

The remaining area realized within the framework of the „Trakt Rudzki” (main path creating green core in the city), co-financed by the EU Infrastructure and Environment

Operational Program 2014-2020, under which they were created: walking paths with lighting and monitoring infrastructure, playground, BBQ area/tables, concrete cubes - view points, open air gym equipment, slide, hammocks, bicycle and skate tracks - total costs 3 640 000 PLN.

The properties covered by the project are the property of the Municipality of Ruda Śląska. For the purposes of the project implementation, in order to ensure the complexity of investment activities, the City received, by way of donation (according to earlier findings) plots owned by the

mining entity. Garages were also moved to carry out the investment, and the City built a new garage complex nearby, harmoniously fitting into the surroundings. The entire investment based on separate agreements is in the maintenance and management of the municipal company MPGM TBS Sp. z o.o.

At the beginning of 6 period, additional investment projects, that were not originally planned, were successfully finalized in connection with the results of the public discussion on the proposed design of the area rehabilitation. It was decided to create additional path in the north part of the spoil heap to get an extra pedestrian path - connection with nearby located Tołstoja Street.

The pilot area in Ruda Śląska was a place where the phytostabilization process was tested for the first time in the area of that size (6,5 ha), that was a public greenery space, so not only the method could be tested in non - laboratory environment but could also become an example of good practice in sustainable land use development, dealing with soil contamination, postindustrial areas and connected to its social problems. That might become a suitable source of experience for not only LUMAT project partners but also other degraded areas, scientific communities and most of all other cities in FUA. The investment in Ruda Śląska has constituted an example of solving a problem of a negative impact of polluted large brownfield located in the middle of a city. The investment is a result of the pilot action concept discussed within the LUMAT project consortium. The pilot design was a result of both discussion in the consortium and at public meetings, at which the inhabitants have expressed their wishes and expectations concerning the future form and functions of the regenerated area.

The whole process of the pilot implementation has been followed step by step by the transnational group of the project partners, therefore it could show how to deal with a problem of regeneration of a contaminated large post-industrial site in a practical way at a relatively low cost.

Due to the high spatial and environmental degradation of the Wirek district in Ruda Śląska, as well as the lack of any green public spaces of a park character, it was decided to transform the wild, neglected, but located in the heart of the district and city, zinc dump. Of course, before a decision was made to use the heap, a number of social consultations, workshops and surveys were carried out as part of the project: POPT - Integrated approach to problems of functional areas on the example of Chorzów, Ruda Śląska and Świętochłowice until 2030 and as part of works on the Local Program Revitalization of the city of Ruda Śląska until 2030, and then the Municipal Program of Revitalization of the City of Ruda Śląska until 2030.

It is also worth mentioning that the central commercial district of the city needed a pedestrian-bicycle connection with the service district - Nowy Bytom, as an alternative to automobile roads.



Thus, there was the possibility of creating a green spine of the city, connecting the northern part of the city with the south, while simultaneously binding existing and planned parks and public spaces.

By creating a new green public space, which is important, safe for health, in particular the district, but also the city, gaining a link, improving communication, improves the health of residents by promoting a healthy lifestyle (walking, cycling, outdoor gym). There is also an educational aspect (educational boards, witnesses of history (sintering pan, dolomite lump, metallurgical tanks, rock witness).

Currently, the object is visited by several dozen people a day, and at the weekend even several hundred.

Since 2014 consultations were conducted with local community within the EU program participation within FUA of Chorzów, Ruda Śląska, Świętochłowice. The social needs and comments were indicated concerning:

values:

accessible green open space, attractive landform, connections with wider open space system, neighbourhood of shopping centre;

disadvantages:

lack of monitoring, menace of violent hooligan behaviour, garbage in area, nearby industry, high voltage line;

needs:

bicycle and ski infrastructure, sport facilities, view point, playground of industrial connotations;

According to that first consultations there was designed the first conception plan.

After thorough assessment of local conditions, threats and relations there was prepared the final conception plan in February 2017. Its assumptions were presented to local community on the meeting in 23.02.2017. Main direction of paths were kept as well as localization of playground, open space sports facility and playing field. Places for grill were moved to the west, to be far from high voltage line. New elements of functional structure were added - mentioned in description of the construction design.

During the investment project phase, the greenery in the area of the planned pilot investment has been inventoried. Due to the collision of the planned development and collision with earthworks planned on the northern scarp of the dumping ground, there was a need to obtain consents appropriate to its removal, which was sanctioned by the following decisions:

- Decision of the President of the City of Chorzów No. 158 of November 6, 2017, sign OS.6131.145.2.2017.R.B.
- Decision no. 2742 / OS / 2017 of the Marshal of the Silesian Voivodship dated 17/08/2017 sign OS-ZD.7120.352.2017.OW; sign OS-ZD.KW-04643/17
- Decision No. 3127 / OS / 2017 of the Marshal of the Śląskie Voivodeship of 14/09/2017 sign OS-ZD.7120.810.2017.OW; sign OS-ZD.KW-05329/17
- Decision of the Mayor of the City of Świętochłowice No. 61/2017, EGO.6131.4497.174.5.257.2017.AB

After the completion of the design phase by the documentation designer "Revitalization of the zinc dumping ground located in Ruda Śląska near 1 Maja and Tolstoja", the investor - Ruda Śląska City applied for the building permit from July 14, 2017. Then, the building permits were issued - decision No. 464-17 of 18/09/2017 mark AU.6740.403.2017. After obtaining a construction permit, the investor submitted a notice about the planned date of commencement of works from 18/12/2017.

A separate procedure has been developed project documentation on "Hardening the pedestrian sequence constituting a link between the street Tolstoja and" Trakt Rudzki "in Ruda Śląska", which was legally sanctioned by the notification of construction and construction works not requiring a building permit of 20/09/2018.

A separate procedure was also the sanctioned implementation of the project "Construction of a set of climbing walls in the area of the revitalized dump near 1 Maja St. with the implementation of a safe floor "by submitting a construction and construction works that do not require a building permit of 9/10/2018.

Revitalization design for zinc spoil heap in Ruda Śląska is an attempt to solve as many problems as possible. According to the sustainable development rules there were taken under consideration technology of remediation and phytostabilization and were applied to all accessible area. On the northern slope there were the most heavy works of land formation to neutralize all health hazards connected with contamination and sharp crags. The slope was flattened. Ground surface was covered with clay and clear soil layer. Central area of the top of spoil heap was treated with phytostabilization and southern slope was maintained in the way to rebuild flora structure with the target to get plant cover not concentrating heavy metals in above the ground shoots. On that area recreation activities are highly limited. All solutions are meant to provide safe environment for people to rest, spend their leisure time and enable some sport activities with no health threat. Some limited parts of the area were left untouched to preserve local flora and provide source for natural succession. To support biodiversity nearly all designed trees are native. Most grass species

except ornamental miscanthus are native too. Only groups of shrubs obscuring electricity transformer stations are introduced using ornamental plants with the highest drought tolerance. Various small architectural forms and sport facilities were applied. The form of them should support local identity. Educational path is providing information about history of the place, industry connected with the area, local flora and fauna and sustainability issues. Spatial and architectural solutions have original form and should be legible and easy to use. Small architectural elements, within that area information elements, are resistible for vandalism and possibly not too much expensive, easy to maintain, repair or exchange. All solutions were designed to follow spatial, social, economical and natural demands of sustainable development and following ideas of green urbanism, the local action for biodiversity, European Landscape Convention and others.

The project will be implemented with respect to the principles of this policy and have a positive impact on it.

The project's products will be available to all groups, regardless of gender, racial or ethnic origin, religion or belief, disability, age or sexual orientation.

7. Documentation photography













