



STRATEGIC ACTION PLAN
IN FUNCTIONAL URBAN AREA
BYDGOSZCZ
IN THE FIELD OF GREENERSITES PILOT
PROJECT ACTIVITIES
IN THE BROWNFIELD AREA:
THE FORMER CHEMICAL PLANTS "ZACHEM"





Table of Content

Introduction.....	4
<i>The scope and structure of the document</i>	Błąd! Nie zdefiniowano zakładki.
<i>The context of pilot actions</i>	5
<i>Pilot actions of the GreenerSites project</i>	7
<i>Consultations and participatory process</i>	9
<i>Methodology of selection and specification of activities</i>	12
Part A. Summary of activities	14
<i>Action 1 - Supporting monitoring and environmental activities in the pilot area</i>	14
<i>Action 2 - Supporting the exchange of information and education</i>	15
<i>Action 3 - Activation and organization of the pilot area function</i>	16
Part B. Detailed description of activities	17
Action 1 - Supporting monitoring and environmental activities in the pilot area.....	17
<i>Activity content</i>	12
<i>A brief description of the problem</i>	12
<i>The objective of the action</i>	12
<i>Involved partners and description of their participation process</i>	12
<i>Planning activities</i>	20
<i>Financing</i>	20
<i>Progress of implementation</i>	20
Action 2 - Supporting the exchange of information and education	22
<i>Activity content</i>	22
<i>A brief description of the problem</i>	22
<i>The objective of the action</i>	12
<i>Involved partners and description of their participation process</i>	23
<i>Planning activities</i>	24
<i>Financing</i>	24
<i>Progress of implementation</i>	25
Action 3 - Activation and organization of the pilot area function	26
<i>Activity content</i>	26
<i>A brief description of the problem</i>	26
<i>The objective of the action</i>	27
<i>Involved partners and description of their participation process</i>	27
<i>Planning activities</i>	28
<i>Financing</i>	28
<i>Progress of implementation</i>	28
References and attachments	Błąd! Nie zdefiniowano zakładki.
<i>Studies and project documents</i>	Błąd! Nie zdefiniowano zakładki.
<i>External bibliography</i>	Błąd! Nie zdefiniowano zakładki.
<i>Internet links</i>	31
<i>Legal report</i>	Błąd! Nie zdefiniowano zakładki.



Introduction

The scope and structure of the document

The document represents the result of D.T 4.1.3 of the GreenerSites project - rehabilitation of brownfield sites in Central Europe. It describes activities related to the project's objectives and experience gained as part of its implementation, which we are convinced that will result in an increase in the effectiveness of environmental management in the pilot area, i.e. the premises of the former Chemical Plant Zachem in the city of Bydgoszcz.

The Strategic Action Plan (SAP) has been developed to summarize the activities undertaken so far and to determine further actions that will allow to optimally use the project's achievements. The following were collected:

- Results of pilot actions taken under the project.
- Results of consultations between stakeholders and the scope of participatory activities that take place in our functional area.

The document consists of four chapters.

The first of these "Introduction" includes:

- Presentation of the pilot area, i.e. the site of the former "Zachem" Chemical Plant.
- Description of activities that have been undertaken as part of the GreenerSites project (pilot activities).
- Description of consultations held between local stakeholders and the participatory process.
- Methodology used to prepare SAP

The next chapter referred to as "Part A" contains a brief description of the activities that have been selected to be implemented under SAP as effective for increasing the effectiveness of pilot area management.

In the "Part B" chapter, the activities set out in "Part A" are described in detail, starting with a description of the scope of activities, stakeholders involved in the time range and analysis of potential problems within the implementation.

The last chapter contains links to documents created as part of ongoing activities, as well as external documents that are important for the project.



The context of pilot actions

Bydgoszcz is one of the largest cities in Poland. In terms of population, it ranks eighth in the country (350 178 people and 317 142 residents registered for permanent residence at the end of 2018). Bydgoszcz is a city with poviats status, the seat of a voivode and the largest city of the Kuyavian-Pomeranian Voivodeship. The city is also the seat of judicial authorities, including the Provincial Administrative Court, financial and banking (including Bank Pocztowy) and church (Bydgoszcz Diocese). It is a significant economic, cultural, scientific and sport center in the country. A military garrison and headquarters of NATO institutions in Poland were located in Bydgoszcz.

Due to its functions, the city is a center of supra-regional significance, but above all it is a center of services for functionally related cities and municipalities - the Bydgoszcz functional area. The boundaries of the well-formed and well-functioning metropolitan area of Bydgoszcz have been naturally determined based on functional connections and cooperation with neighboring municipalities that has been undertaken for many years. This cooperation most often took the form of concluded agreements regarding the implementation of various types of social, economic and spatial projects.

An increasingly functional area integration has resulted in the establishment of the Bydgoszcz Metropolis Association. On September 15, 2016, 19 cities and communes and 2 poviats joined the Association. Its primary goal is to further strengthen voluntary cooperation and mutual support of members of the Association

in joint actions undertaken for the comprehensive development of the Bydgoszcz Functional Area. The total area covering the Association's impact area is 3 492 km², which is 20% of the region's area. This area has about 620,000 inhabitants, or 30% of all inhabitants of the Kuyavian-Pomeranian Voivodeship.

The development of cooperation between local government units in the Area is evidenced by a number of new agreements concluded by the members of the Association, regarding construction, maintenance and operation of a regional installation for municipal waste processing, expansion of the Bydgoszcz Purchasing Group, and in January 2019 about readiness to undertake joint work related with the preparation and implementation of the Sustainable Urban Mobility Plan (so-called SUMP).

Bydgoszcz is a city with a convenient geographical location, lying at the intersection of road, rail and water routes. It is located in the Brda River Valley and along the Bydgoszcz Canal, bordering the Vistula from the east. In the topography of Bydgoszcz - next to the post-glacial river valley - upland scarp is the dominant element.

In the south-eastern part of the city on an area of approx. 2000 ha, the "Zachem" Chemical Plant was located. Until 2012, Zakłady Chemiczne "Zachem" was the largest employer in Bydgoszcz (over 7 thousand employees) and one of the largest producers of organic chemistry in Poland. The most important products manufactured at the plant were: toluene diisocyanate, allyl chloride, epichlorohydrin, hydrochloric acid and sodium hydroxide. The final products manufactured include polyurethane foams. In the 90s the company was divided, separating the production of explosives from it ("Nitro-Chem") and establishing 16 auxiliary services companies:



renovation, transport, design, warehouse and social. At the end of 2012, "Zachem" ceased production activity, and in 2013 the company Infrastruktura Kapuściska S.A. was created, which was set up on March 14, 2014 in bankruptcy. Name: the area of the "Zachem" Chemical Plant is today a historical and conventional term.

Convenient location within the city limits and existing technical infrastructure and communication influenced the decision to establish in 2004, on part of the former premises of the "Zachem" Chemical Plant, Bydgoszcz Industrial and Technological Park, whose majority shareholder is the City of Bydgoszcz. The company's goal is to stimulate entrepreneurship and create new jobs by creating favorable investment conditions for companies. The park undertakes active development activities, including by modernizing technical and road infrastructure, building two halls together with an administrative and social connector, the IDEA Przestrzenie Biznesu office building. The BPPT area covers 286.4 ha. At the end of 2009, a part of the BPPT area of nearly 46 ha was included in the Pomeranian Special Economic Zone.

Among the companies operating in the area (outside the BPPT), there are: Metalko Sp. z o.o., Boruta-Zachem S.A. and Purinova Sp. z o.o. Most often they lease buildings that have been adapted at their expense to run various business activities. These entities conclude separate contracts for the supply of energy, water and sewage discharge to the sewage network.

Due to the rich history of this area, part of the area was allocated to Explozeum - an open-air museum of German industrial architecture from World War II together with an underground tourist route.

At present, the ownership of the area of the former "Zachem" Chemical Plant is divided between: State Forests, the Municipality of Bydgoszcz, and private owners of companies operating in this area.

The area is polluted by industrial waste dumps and former industrial installations. Groundwater and soil are contaminated with organic pollutants. So far, over 20 probable sources of pollution have been identified. Despite the activities carried out so far, the area still needs further research.

In the immediate vicinity of the former "Zachem" Chemical Plant there are inhabited areas: the Łęgowo, Zimne Woda - Czersko Polskie housing estates, Kapuściska and Płatnowo and Otorowo. Environmental pollution associated with the migration of pollutants in groundwater to the areas inhabited and used for agriculture in the Vistula valley cause social anxiety and affect the life of the local community.

In the city of Bydgoszcz there are the following strategic documents that deal with the problem of environmental protection:

- Municipal Revitalization program
- Environmental protection program for the City of Bydgoszcz
- Bydgoszcz City Development Strategy



Pilot actions of the GreenerSites project

The GreenerSites project - rehabilitation of post-industrial areas in Central Europe was implemented by the City of Bydgoszcz as part of the international cooperation program Interreg Central Central Europe Priority Axis 3: Cooperation in the field of natural and cultural resources for sustainable economic growth in Central Europe Specific objective 3.3: Improving environmental management in functional urban areas to improve living conditions. The implementation of the pilot action of the GreenerSites project consisted of examining the impact of soil and groundwater pollution of the former "ZACHEM" chemical plants on neighboring areas. As part of the above project, the following activities were carried out:

1. Environmental monitoring of the pilot area

Contractor: Arcadis sp.z o.o.

As part of the action were done:

- a) Inventory of individual and intake wells and piezometers within the boundaries of the Łęgnowo Wieś housing estate and its vicinity, in the area contaminated as a result of the activities of the former "ZACHEM" Chemical Plant in Bydgoszcz. Location measurements (GPS) and technical measurements were made. In the case of undeveloped wells, wherever possible, measurements were taken of the level of the groundwater table and the depth of the well, with an accuracy of 1 cm. An inventory card was prepared for each well, which contains basic information about the object, such as: address, geographical coordinates, well depth, well diameter, depth up to water or location description. In addition, during the inventory field water tests were carried out, which included measuring temperature, pH, electrolytic conductivity (PEW) and redox potential (Eh).
- b) Inventory of monitoring wells that are part of the monitoring network of the former "ZACHEM" Chemical Plant in Bydgoszcz. As in the case of individual wells, an inventory card was prepared for each piezometer / borehole inventoried, including location information (geographical coordinates, location description), current piezometer condition (type and condition of housing, use, protection method), as well as basic technical data for the observation hole such as diameter, bottom depth, depth up to groundwater, enclosure height, etc. Field inventory tests of water samples in the range of: pH, PEW and Eh temperature
- c) Sampling and physicochemical analyzes in 10 representative holes of the monitoring network of the former "Zachem" by sampling
- d) Sampling and physicochemical analyzes in 8 representative wells by water sampling
- e) Installation of 15 piezometers to a depth of 7.5-18 m above sea level
- f) Field measurements, observations, consumption. In total 21 soil samples and 15 groundwater samples, laboratory tests were performed.
- g) Development of guidelines for further monitoring

Conclusions from the action:



From the results of laboratory tests of groundwater samples it appears that at the location of each of the installed piezometers, the waters of the first aquifer are polluted by toxic organic and inorganic compounds that have infiltrated the area of the documented works from the former "ZACHEM" Chemical Plant.

2. Hydrogeological model of groundwater flow and pollution migration,

Contractor: Geological Enterprise in Wrocław PROXIMA S.A.

As part of the measure, a forecast was made for the further movement of groundwater pollution towards areas inhabited by people.

The analysis and selection of parameters, indicators groundwater pollution most burdensome and characteristic subject to further analysis using numerical modeling was based solely on archival materials. Indicators of impurities that were subject to detailed analysis of migration on the numerical model were sulfates, chlorides and organic compounds: phenol, aniline, toluidine, toluenediamine, chloroaniline and nitrobenzene. Numerical tests of migration of pollutants for individual substances are documented on numerous graphic attachments (60 figures), for individual time ranges during +25 years for sulfates and chlorides and during +50 years for organic compounds

Conclusions from the action:

The analysis of pollutant migration shows that the area of contaminated groundwater, in particular with organic compounds, will gradually expand towards built-up areas in Łęgów, causing progressive degradation of groundwater of the usable level.

3. Soil research in the Łęnowo Wieś housing estate.

Contractor: DEKONTA Polska Sp. z o. o.

The housing development area at the Łęnowo Wieś estate with an area of 31.1 ha was divided into 20 research sections, taking into account primarily the location of groundwater pollution clouds and the terrain. The location of 9 research wells were determined, whose coordinates represent the focal points of selected areas. The substances intended for health risk analysis were selected by assigning each cloud of pollution appropriate foci and types of pollution. For cloud 1: PAH, cloud 2: PAH, 2-chlorophenol, toluene, cloud 3: PAH, nitrobenzene, onitrotoluene, cloud 4: epichlorohydrin, toluene diisocyanate (TDI), PAH, nitrobenzene, onitrotoluene, toluene, epichlorohydrin, toluene diisocyanate, PAH, nitrobenzene, o-nitrotoluene, cloud 5: epichlorohydrin, toluene diisocyanate (TDI), PAH, nitrobenzene, onitrotoluene; for all sections: total organic carbon (TOC); soil air porosity; soil water porosity (or humidity); soil volume density. Additional, six aggregate samples were taken from areas where soil contamination was documented and residents provided information on the use of groundwater for watering gardens. In total, 43 soil samples were submitted for laboratory analysis, of which 26 surface samples (0.0-0.25 m p.p.) and 17 samples from a depth below 0.25 m p.p. Considering the above, the results of laboratory tests of soil



and soil samples were compared with the permissible values for the first group of soils referred to in §3, section 1 of the Regulation of the Minister of the Environment of September 1, 2016 on the method of conducting an assessment of ground surface pollution (Journal of Laws 2016 item 1395).

Conclusions from the action:

In the tested samples no substances characteristic of the ZACHEM production profile were found, in some places PAH levels exceeding the norms were determined.

4. Health risk analysis -

Contractor: Institute of Ecology of Industrial Areas (IETU)

The analysis of health risk is aimed at analyzing the potential negative health effects that may occur as a result of exposure to harmful substances present in the environment of residential buildings in the area of Łęgowa Wieś. The analysis of health risk will include:

- development of the input data set,
- performing an exposure assessment
- toxicity assessment, characterize the health risk for residents, involving the integration of the results, evaluation of the toxicity and exposure assessment,

determination of local, safe for health content of pollutants (RBRL), i.e. local remediation criteria, in case of exceeding the level of acceptable risk. In addition, international and local training sessions and study visits were carried out as part of the GreenerSites project. This enabled the exchange of experience in managing brownfield sites and deepening knowledge.

5. International Training on Sustainable Remediation and Study Visit

On 10.05.2017, in the Bydgoszcz Industrial and Technological Park in Bydgoszcz, an international training on sustainable remediation took place combined with a study visit at the premises of the former "ZACHEM" Chemical Plant. The event was attended by both representatives of the GreenerSites project partners and local stakeholders, the total number of participants was over 60 people. As part of the training, practical examples of remediation from other European cities were presented, experts from Europe presented how to assess and choose the best regenerative solutions as well as what challenges are facing brownfield owners.

6. Local trainings for entrepreneurs and institutions

In January 2019, local training sessions on post-industrial area pollution took place at the Bydgoszcz Center for Non-Governmental Organizations. The trainings were addressed to representatives of environmental protection bodies and local entrepreneurs. During the trainings, experts from the Central Mining Institute in Katowice presented legal issues; health risk, remediation technology, environmental research, geoinformation and migration of pollutants.



7. Web GIS Tool

In order to carry out its tasks more effectively, the City of Bydgoszcz has received from the project partner of the Ministry of Regional Development and Transport of Saxony Anhalt, the GreenerSites Web-GIS Tool. It is a land information system for cooperation between public authorities and stakeholders who deal with the rehabilitation of degraded areas. It can include existing surveying services in accordance with the INSPIRE directive and other online map services (e.g. OpenStreetMap, CORINE LandCover, Urban Atlas). The basic functions are data sharing, map viewer, search function, spatial analysis functions (via QGIS) and the ability to create and export fact sheets. The GreenerSites Web-GIS tool allows partners to share their information in a web application to which designated users have access. Even stakeholders who do not have their own GIS can view maps in a browser. The tool is based on the EU-recommended reference framework for geodata ETRS89 (European Terrestrial Reference System 1989) and offers user-friendly features for configurable data integration mechanisms.

Currently, the tool is installed thank courtesy of the Regional Director for Environmental Protection in Bydgoszcz on the servers of the Regional Directorate for Environmental Protection. It is fully functional and data obtained as part of the GreenerSites project are systematically entered into it. The tool can be accessed at the link <http://cob.greenerites.eu/map/>.

||



Consultation and participatory process

In order to successfully implement the GreenerSites project, it was necessary to conduct a consultation process to engage stakeholders in activities and possibly broad information on the assumptions and effects of the project. To this end, the city conducted a number of its own activities, as well as participated in events organized by other stakeholders.

GreenerSites stakeholders can be divided into three main groups by their characteristics:

- Residents of the pilot area and the city of Bydgoszcz
- Institutions dealing with environmental protection
- Entrepreneurs operating in a pilot area

1. Consultations with residents

In order to inform about the GreenerSites project among the residents of the city of Bydgoszcz and especially in the most vulnerable to the influence of former Chemical Plant "Zachem" district of Łęgowo Wieś, representatives of the city of Bydgoszcz took part in a meeting with residents organized

as part of the WODA + project by the AGH University of Science and Technology Stanisława Staszica in Kraków at the seat of the Łęgnowo Wieś Housing Estate Council. The above meeting took place on 01.12.2017. There, the city of Bydgoszcz presented the assumptions of the GreenerSites project, consulted plans for future activities and received social responses.

The problem of managing the former brown industrial area of former Zachem also appeared frequently as a meeting point of the City Council. Sessions regarding the area of the former "Zachem" Chemical Plant were held in 2018 on March 28, October 17, October 19 and in 2019 on January 30, February 26, March 28, April 24, May 29.

The inhabitants of Bydgoszcz was also be invited to a meeting summarizing the pilot activities that take place on July 30, 2019 in the club room of the Łęgowo Wieś estate.

2. Consultation of institutions

Throughout the entire duration of the project, intensive activities were carried out to familiarize institutional stakeholders with the content, subject matter and objectives of the project, and to establish cooperation in determining the directions of further activities and their implementation. To this end, meetings of the Local Stakeholder Group took place. Two of them took place at the headquarters of Miejskie Wodociągów i Kanalizacji in Bydgoszcz Sp. z o.o. on Stakeholders on 19.01.2017 and 03.10.2017, and one meeting took place in the Voivodship Office of the Kujawsko-Pomorskie Voivodeship in Bydgoszcz on 03.10.2017. As part of these meetings, directions for project development were determined and future cooperation opportunities were determined. Stakeholders participating in the meetings were representatives of the Provincial Inspector for Environmental Protection, the Regional



Director for Environmental Protection, the Kujawsko-Pomorskie Voivode, and the Kujawsko-Pomorskie Regional Director for Environmental Protection, the State Poviats Sanitary Inspector in Bydgoszcz, the State Provincial Sanitary Inspector in Bydgoszcz, the University of Technology and Life Sciences in Bydgoszcz Wodociągów i Kanalizacji w Bydgoszcz Sp. z o.o. and the City of Bydgoszcz.

Representatives of the City of Bydgoszcz took an active part in the work of the Provincial Expert Team for assessing the state of Environmental Pollution, including soil and water as well as assessing any contaminants that may have occurred in the area of the former "Zachem" Chemical Plant in Bydgoszcz, appointed by the Kujawsko-Pomorskie Voivodship Regulation No. 62 / 2018 of March 7, 2018, as amended d. The chairman of the team was Dariusz Wrzos - Vice President of WFOŚiGW in Toruń. The team's basic tasks were:

- current assessment of environmental pollution, including soil and water environment, as well as assessment of pollution generated on the premises of the former "Zachem" Chemical Plant in Bydgoszcz
- monitoring threats to safety, human health and threats of irreversible damage to the environment in the area of the lower terrace of the Vistula and Brda
- cooperation with residents of endangered areas, in particular informing residents about the real threat to health.

The Kuyavian-Pomeranian Voivode in a letter of 19/03/2019 announced that he had dissolved the Provincial Expert Team.

Representatives of the city of Bydgoszcz took part in meetings of the Degraded Area Team appointed in October 2016 by the Minister of the Environment

His tasks include:

- analysis and presentation of proposals for legal and organizational solutions in the field of remediation of areas where land surface pollution occurs
- dealing with places of waste accumulation that pose a threat to human health or life
- revitalization of areas with adverse changes in the natural shape of the earth's surface.

The topic of the former Chemical Plant "Zachem" in Bydgoszcz took place at two meetings of the Degraded Area Team: in March 2017 and April 2018, at which representatives of the City of Bydgoszcz and other authorities presented information on the occurring threats in the pilot area.

In addition, local stakeholders was invited to a meeting summarizing the pilot activities that take place on July 30, 2019 in the club room of the Łęgowo Wieś



Methodology of selection and specification of activities

The Strategic Action Plan for the pilot activities of the GreenerSites project was created as a result of the strategic planning process under which the following steps were carried out:

1. The pilot actions carried out under the GreenerSites project have been summarized so far
2. The actions that we want to take in the near future and the directions of actions in the long term that will ensure the durability of the project results and increase the efficiency of environmental management have been determined.
3. Stakeholders were identified who, due to their competences, were interested in using the effects of the project, and their role in the participation process was described.
4. Stakeholders were consulted to determine the final appearance of the Strategic Action Plan.

In order to collect the necessary input data to the Strategic Action Plan, a meeting was held on May 27, 2019 to consult SAP conducted by Utila. It was conducted in the form of workshops to obtain the full involvement of participants in the process of creating a co-creation of the Strategic Action Plan. As part of the meeting, an attempt was made to prioritize task proposals by the "theme screening" method. As far as possible, the collected applications were decided to be used as part of SAP implementation.

SAP was written in order to summarize the activities undertaken so far as part of the GreenerSites project to determine further activities and development directions that will allow to optimally use the current results of the project.



Part A. Short description of activities

Action 1 - Supporting monitoring and environmental activities in the pilot area

The City of Bydgoszcz will undertake actions aiming at using the results of the GreenerSites project in order to facilitate and optimize monitoring and environmental activities carried out by other entities, intends to support them in this area and seek funding for such activities in the future, both on its own and in cooperation with stakeholders. For this purpose:

- The results of the inventory research carried out under the GreenerSites project and methodological guidelines for further monitoring will be made available to other entities conducting activities in the field of environmental protection in the pilot area.
- The hydrogeological model of pollution flow created as part of the project will be forwarded to other stakeholders.
- The health risk analysis for the pilot area will be forwarded to other stakeholders. Its results should help assess the degree of threat to residents due to pollution and thus will guide further environmental action.
- GreenerSites employees will, as far as possible and directed questions, support stakeholders in the knowledge and experience acquired under the GreenerSites project.
- The City of Bydgoszcz will actively seek external funds for activities related to environmental protection or regeneration of the pilot area, and is willing to participate in future projects organized by external entities.
- Support of ongoing remediation and environmental protection projects in the pilot area (eg. project "Remediation of contaminated areas in the area of the former" ZACHEM "Chemical Plant in Bydgoszcz to eliminate health threats and environmental protection, including for the Natura 2000 area the Lower Vistula Valley and the Baltic Sea "implemented by RDOŚ).
- Support for environmental protection bodies, as far as the City of Bydgoszcz's capabilities and competences, in conducting monitoring activities in the pilot area.
- Undertaking or joining in the future lobbying activities aimed at drawing attention to the ecological problem of the former Chemical Plant Zachem.



Action 2 - Supporting information exchange and education

The City of Bydgoszcz will take activities to improve the quality of information exchange between stakeholders, speed up the circulation of documents and maintain positive relations that have been established between the City of Bydgoszcz and other Stakeholders. For this purpose:

- The city of Bydgoszcz intends to strive to maintain positive relations between the institutions involved in the project by consulting planned activities in the field of environmental protection and participation in all kinds of working groups and task teams that will deal with the subject of pollution in the area of the former "Zachem" Chemical Plant.
- The City of Bydgoszcz will support initiatives aimed at developing a coherent and effective platform for exchanging documentation between institutions in the field of environmental protection
- The GreenerSites Web GIS Tool created as part of the project will be developed and supplemented with data provided by stakeholders and the city of Bydgoszcz. As part of future research in the pilot area, the city intends to prepare data in the Shape (SHP) format for quick introduction to the tool.
- The city of Bydgoszcz intends to implement ventures for engagement in solving problems and developing solutions for the local community and other stakeholders. The undertakings will include a broad informational and educational campaign as well as the implementation of various tools for participation and partnership at the stage of planning and implementation of tasks.
- the City of Bydgoszcz intends to collect and analyze information, opinions and suggestions from residents of the pilot area and other residents of the city in the field of environmental activities, and take them into account when planning future activities and projects.



Measure 3 - Activation and organization of the pilot area functions

The city of Bydgoszcz will support activities aimed at ensuring better use of the pilot area and developing an intelligent (smart) way of functioning of the post-industrial area and its surroundings. Aim is the reconstruction of the area and its development in accordance with the principles of permanent and balanced development, resulting in stabilization of its environmental characteristics.

The effects of implemented projects, in spatial scope, will go beyond the administrative boundaries of Bydgoszcz, to the areas of neighboring communes (Bydgoszcz Functional Area). The implemented solutions will contribute to increasing the attractiveness and competitiveness of Bydgoszcz and the Bydgoszcz Functional Area as a place of residence and conducting business activity.

For this purpose:

- The Urban Urban Workshop will continue work aimed at creating the Local Spatial Development Plan for subsequent fragments of the pilot area.
- Bydgoszcz Industrial and Technological Park will continue to implement cubature and infrastructure investments, coordinate the activities of entities operating in the park and encourage further investments to improve the use of the area.
- The City of Bydgoszcz, the Bydgoszcz Regional Development Agency and the Bydgoszcz Industrial and Technological Park will actively seek external funds for activities related to the activation of the area and / or improvement of the environment of the pilot area.
- Continuation of the expansion and ongoing repairs of the road infrastructure under the management of ZDMiKP in accordance with the planned investment plan on the premises of the former ZACHEM Chemical Plant.



Part B. Detailed description of activities

Action 1 - Supporting monitoring and environmental activities in the pilot area

Activity content

As part of the action it is planned to:

- Familiarization stakeholders with the project results
- Providing access to research and inventory results obtained as part of the GreenerSites project and guidelines for further monitoring to other entities conducting environmental protection activities in the pilot area.
- Transfer of the hydrogeological model of pollution flow created as part of the project to other project stakeholders.
- Provide the other stakeholders health risk for the pilot area.
- Providing to other stakeholders methodological guidelines for conducting soil and water environment monitoring in Bydgoszcz at the Łęgnowo-Wieś estate.
- Support stakeholder by knowledge and experience of project employees.
- Conducting an active search for external funds for activities related to environmental protection or revitalization of the pilot area.
- Cooperation with stakeholders in the event of joint project proposals in the field of environmental protection in the pilot area and supporting those currently underway.
- Undertaking or joining in the future lobbying activities aimed at drawing attention to the ecological problem of the former Chemical Plant Zachem.

Short description of the problem

As part of the GreenerSites project, pilot activities in Bydgoszcz was realized examining the impact of degraded area (former Chemical Plant "Zachem" in Bydgoszcz) on neighboring areas (ŁĘGNOWO) along with the development of an environmental and health risk assessment, hydrological model and further monitoring guidelines. In addition, a new monitoring network was made up of 15 new piezometers. In order to fully utilize the potential of the results obtained from the GreenerSites project implementation, measures should be taken to enable their dissemination and inclusion in ongoing activities.



Despite a number of studies and analyzes carried out as part of the GreenerSites project, there is still a need to deepen the analyzes carried out, carry out more extensive research, and continue the existing monitoring processes to learn about the state of the pilot area, its impact on surrounding areas, and monitor future environmental changes. As part of the GreenerSites project was prepared methodological guidelines for conducting soil and water environment monitoring in Bydgoszcz at the Łęgnowo-Wieś estate, within which the existing monitoring system, the type and number of samples proposed to be taken, the methodology of sampling, and the proposed scope of analytical tests together with the cost analysis were presented.

In addition, the need for land reclamation forces the search for sources, financing and actions that will allow to face the growing threat. Due to the scale of the problem, competence problems and a complicated ownership situation, it is unlikely to be able to determine those responsible for causing the pollution in the near future. In connection with the above, external financing sources enabling implementation of activities with a significant percentage of funding, such as the Operational Program Infrastructure and Environment, the Life Program or Horizon 2020 become more valuable.

Due to the huge scale of the problem, competence problems, difficulties in identifying entities responsible for contamination and insufficient funds, the solution to the problem of pollution flowing from the former "Zachem" Chemical Plant requires support at the level of central authority. Paying attention to this problem of central organs requires lobbying.

Purpose of activities

The goal of the activities is to effectively use the project results, i.e. environmental analyzes, installed infrastructure and acquired experience to:

- Contribute to the optimization of future monitoring and revitalization processes implemented in the pilot area.
- Effective use of the infrastructure created under the project in the form of a monitoring system consisting of 15 piezometers.
- Disseminate the results of environmental research and analyzes received under the GreenerSites project.
- Find external financing sources for further environmental activities.
- Improve the environment in the pilot area.

Stakeholders involved and description of their participation process

Action 1 will apply to all institutional stakeholders of the GreenerSites project in particular those who conduct monitoring activities in this area

- Mayor of the City of Bydgoszcz
- Chief Inspector for Environmental Protection
- Voivodship Inspector for Environmental Protection
- Poviats Inspector for Environmental Protection



- Voivodship Inspector for Environmental Protection in Bydgoszcz
- State Poviast Sanitary Inspector in Bydgoszcz
- State Provincial Sanitary Inspector in Bydgoszcz
- Polish Geological Institute National Research Institute
- Marshal of the Kuyavian-Pomeranian Voivodeship
- The Kuyavian-Pomeranian Voivode
- Miejskie Wodociągi i Kanalizacja Sp. z o.o. (MWiK)
- Bydgoszcz Park of Technology and Industry Sp. z o.o.,
- University of Technology and Life Sciences in Bydgoszcz
- Central Mining Institute (GIG)

The above stakeholders will be provided the results of the GreenerSites project, which they will use to improve the efficiency of planning their own activities in the pilot area.

They will be informed about the possibility of using the piezometer network installed for the purposes of the GreenerSites project for their own research after obtaining permission from the City of Bydgoszcz.

The city of Bydgoszcz is willing to cooperate in the case of future joint projects in the field of environmental protection in the pilot area, and will actively search for applications for EU funds for this purpose.

The employees of the GreenerSites project will be ready to share experience and knowledge in the field of information on the state of the environment in the pilot area with environmental protection institutions in order to increase the efficiency of environmental management in this area.

Miejskie Wodociągi i Kanalizacja Sp. z o.o. will use the presented hydrogeological model of pollutant flow as part of creating proprietary models of water flow in the pilot area

The analysis of health risk will be important information for the WSSE and PSSE on the threat to health of residents in the pilot area and in the area of its direct impact.

In addition, the city will provide all possible assistance in the implementation of environmental activities (remediation and monitoring) as long as the assistance mentioned falls within the competence and / or capacity of the authority which is the Mayor of the City of Bydgoszcz.

A wide range of lobbying activities will be carried out to draw the attention of central authorities to the problem of pollution of the areas of the former "Zachem" Chemical Plant.



Action planning

Some actions to disseminate the results of the GreenerSites project have already been undertaken.

Their extension consisting in extending the list of entities to which the results will be sent, is a matter of the nearest time horizon

The search for new financing possibilities for environmental activities in the pilot area is also ongoing. One of the effects was the submission of an application under the Horizon 2020 program in cooperation with the Central Mining Institute (GIG) for the HEART project, which was to lead to the continuation of monitoring activities started under the GreenerSites project.

In the longer term, we hope to achieve the effects of our current efforts and proceed with the implementation, whether alone or in cooperation with other stakeholders, of new projects in the field of environmental protection that will lead to the improvement of the state of the environment in the pilot area.

Financing

Activities aimed at disseminating the results of the GreenerSites project are financed from project funds

Routine monitoring activities will be carried out as part of their statutory financing by the responsible units.

Other activities implemented under the measure do not require additional funding.

Progress of implementation

The following activities were carried out:

The tests, inventories and methodological guidelines for further monitoring are prepared in a structured form that allows for quick shipment.

The hydrogeological model of the flow of pollutants has been prepared and is ready to be sent electronically.

The monitoring network built for the GreenerSites project in the ZACHEM area, consisting of 15 piezometers, is ready for use, the office has the necessary set of keys for access.

The City of Bydgoszcz submitted an application in cooperation with the Central Mining Institute (GIG) for the HEART project under the Horizon 2020 program, which was to lead to the continuation of monitoring activities started under the GreenerSites project, unfortunately the villages were not selected for implementation.

The search for cooperation opportunities and financing for further environmental activities is ongoing.

According to PIG-PIB, this year four of the newly drilled piezometers will be used for the purposes of PIG-PIB monitoring.

The Regional Directorate for Environmental Protection in Bydgoszcz implements the project "Remediation of contaminated areas in the area of the former Chemical Plant" ZACHEM "in



Bydgoszcz in order to eliminate health and environmental hazards, including the Natura 2000 area of the Lower Vistula Valley and the Baltic Sea”. The total area of reclaimed land assumed in this project is 26.9 ha. Activities include:

- geological works design and drilling of capture and injection wells,
- construction of an innovative installation for the purposes of water purification,
- carrying out initial state environmental tests,
- carrying out remediation activities with ongoing monitoring,
- design and implementation of a nature trail



Action 2 - Supporting the exchange of information and education

Activity content

Actions will be taken to improve the quality of information exchange between stakeholders, speed up the circulation of documents and maintain favorable relationships that have been established between the city of Bydgoszcz and other stakeholders. For this purpose:

- The city of Bydgoszcz intends to maintain positive relations between the institutions involved in the project by consulting planned activities in the field of environmental protection and participation in all kinds of working groups and task teams that will deal with the topic of pollution in the area of the former Zchem Chemical Plant.
- the City of Bydgoszcz will support all initiatives aimed at developing a coherent and effective platform for exchanging documentation between institutions, in the field of environmental protection
- The city of Bydgoszcz intends to implement activities for engagement in solving problems and developing solutions for the local community and other stakeholders. The projects will include a broad informational and educational campaign as well as the implementation of various tools for participation and partnership at the planning stage and implementation of tasks.
- the City of Bydgoszcz intends to collect and analyze information, opinions and suggestions from residents of the pilot area and other residents of the city in the field of environmental activities, and take them into account when planning future activities and projects.

Short description of the problem

The implementation of the GreenerSites project has demonstrated the need to improve the quality of information flow on the pilot area.

As part of the work carried out, a large fragmentation of documentation on the pilot area, research results and analyzes became apparent. Obtaining subsequent documents took a large part of the time allocated for the implementation of activities and caused numerous organizational problems. Therefore, there is a need to develop a common format for exchanging documentation that will speed up this process at least in relation to the pilot area

The need for a platform for consultation on environmental activities between local authorities in order to develop joint solutions and maintain positive relations has already been observed and was partly implemented within the framework of the Provincial Expert Team for the assessment of the state of environmental pollution and the Team for degraded areas established in October 2016 by the Minister of the Environment. In connection with the termination of the Voivodship Expert Team, there is a need to create a new team using the conclusions from previous work results to coordinate environmental activities between institutions in the pilot area.



Experience gained in cooperation with residents has demonstrated the need for future environmental education activities in the pilot area.

The inhabitants of Osiedle Łęgowo Wieś feel omitted during the implementation of environmental activities in the pilot area, this is a highly unfavorable situation and requires solutions through educational activities, consultations with residents and implementation, as far as possible suggestions from residents.

Purpose of activities

- Accelerate the circulation of documents related to the pilot area by developing a platform for the exchange of documentation between institutions.
- Further development and supplementation of the Web GIS Tool created as part of the GreenerSites project.
- Creation of a new Zachem team whose creation process will take into account the conclusions from the effects of the work of the Provincial Expert Team for assessing the state of Environmental Pollution, and thus proves to be a more effective tool to solve the environmental problem.
- Maintaining positive relationships between institutions that have been established as part of the GreenerSites project.
- Involving the local community in problem solving and developing solutions on the environmental problems of the pilot area.
- Improving the social atmosphere and image of the city among the inhabitants of the Łęgowo Wieś housing estate.
- Training residents of Łęgowo Wieś in the safe use of the environment.

Stakeholders involved and description of their participation process

The same institutional stakeholders are to be involved in the activities carried out, as in the case of Action 1.

Their role should be above all

- Developing a knowledge exchange platform and further specifying the scope within which the exchange would take place.
- Supplementing and developing the geoinformation tool.
- Developing proposals for the composition and form of the new Zachem team.
- Consulting and / or informing residents about the environmental activities carried out by individual institutions.

Activities in the field of environmental education are to involve the inhabitants of Łęgowo as key stakeholders.



Planning activities

The GreenerSites Web GIS Tool geoinformation tool installed on RDOŚ servers is a promising space for the exchange of information in the field of geospatial data. It will, if possible, be further developed and regularly supplemented by the City of Bydgoszcz and other stakeholders.

In order to accelerate the exchange of documentation between institutions, the creation of a separate platform giving the possibility of highly flexible sharing of documentation is being considered. To this end, it will be necessary to conduct a meeting between stakeholders in order to develop the form and scope in which the platform would be operating, as well as the expected costs and determine the financing methods.

In order to create a new ZACHEM team, meetings between stakeholders will be required to develop the composition and legal form of the planned team, taking into account the conclusions of the Provincial Expert Team for assessing the state of environmental pollution. You will also need to set a period after which the activities of such a team will be summarized and the advisability of further action in a specific composition will be verified.

Educational activities in the pilot area should be preceded by determining the educational needs of the inhabitants of Łęgowo, identifying stakeholders who would like to participate in such activities, preparing a joint plan and scope of activities. After completing these steps, proceed to their implementation.

In addition, there will be ongoing consultations with residents and including them in ongoing activities to this end will be carried out:

- Informing residents about the environmental activities carried out in the pilot area using the ZACHEM tab on the City website.
- Transfer of the most important information on two information boards placed as part of the GreenerSites project at the Osiedle Łęgowo Wieś.
- Analyzing suggestions of environmental activities sent by residents and two-way communication in this area in order to develop the most effective solutions.

Finansowanie

Activities will be financed from the funds of individual stakeholders to an extent depending on the degree of their involvement and the scale of participation.

Progress of implementation

An announcement was issued inviting to a meeting summarizing the pilot activities that will take place on July 30, 2019 in the club room of the Łęgowo Wieś estate.

The GreenerSites Web-GIS Tool geoinformation tool was created installed and configured on RDOŚ servers, constituting a developable platform for exchanging geospatial data between institutions.



A tab about Zachem was created on the official website of the City of Bydgoszcz, which enables effective communication with the residents.

Two information boards were placed at the Łęgnowo Wieś estate which are used for direct communication with the residents of the estate.

As part of the existence of the Provincial Expert Team for the assessment of the state of environmental pollution, relations giving hope for effective cooperation between institutions in the future.

The city of Bydgoszcz participated in the GreenerSites project in social consultations with residents referred to in SAP in the chapter "Introduction" in the subsection "consultations and the participatory process - meetings with residents".

A concept of trainings in the field of safe use of the environment was prepared for the inhabitants of Łęgnowo Wieś.



Action 3 - Activation and organization of the functions of the pilot area

Activity content

The city of Bydgoszcz will support activities aimed at ensuring better use of the pilot area and developing an intelligent (smart) way of operation of the post-industrial area and its surroundings, and ultimately the reconstruction of the area and its development in accordance with the principles of permanent and balanced development, resulting in stabilization of its environmental characteristics and economic development.

For this purpose:

- The Municipal Urban Workshop (MPU) will continue work aimed at creating the Local Spatial Development Plan for subsequent fragments of the pilot area.
- Bydgoszcz Industrial and Technological Park will continue to implement cubature and infrastructure investments, coordinate the activities of entities operating in the park and encourage further investments to improve the use of the area.
- The City of Bydgoszcz, Bydgoszcz Regional Development Agency and Bydgoszcz Industrial and Technology Park will actively seek external funds for related activities with the activation of the area and / or improvement of the environment of the pilot area.
- Continuation of the expansion and ongoing repairs of the road infrastructure under the management of ZDMiKP in accordance with the planned investment plan on the premises of the former Zachem Chemical Plant.

Short description of the problem

Restructuring processes and subsequent liquidation of the ZACHEM Chemical Plant and the cessation of the current production profile resulted in the need to reorganize the current spatial and organizational order in order to effectively transform the area to perform new economic functions.

Effective transformation is hampered by a complicated ownership structure and the threat posed by post-industrial pollution of the area to the surrounding areas, largely areas of high landscape and ecological value.

Purpose of activities

- Efficient development of the entire area of the former Zachem Chemical Plant.
- Ensure compliance of future investments with the principles of sustainable development.
- Increasing the number of implemented investments in the pilot area
- Economic activation of the area.



- Improving the efficiency and consistency of environmental management in the pilot area.
- Acquiring funds for further activities in the above areas

Stakeholders involved and description of their participation process

The following stakeholders are to be involved in the implementation of the action:

- Mayor of the City of Bydgoszcz
- Municipal Urban Workshop in Bydgoszcz
- Municipal Road and Communication Board in Bydgoszcz sp z o.o.
- Bydgoszcz Regional Development Agency
- Bydgoszcz Industrial and Technology Park

The Municipal Urban Workshop in Bydgoszcz will continue work aimed at creating the Local Spatial Development Plan of subsequent fragments of the pilot area.

The Bydgoszcz Industrial and Technology Park will continue to carry out cubature and infrastructure investments, coordinate the activities of entities operating in the park and encourage further investments to improve the use of the area.

The City of Bydgoszcz, Bydgoszcz Regional Development Agency and Bydgoszcz Industrial and Technology Park will actively seek external funds for related activities with the activation of the area and / or improvement of the environment of the pilot area.

Continuation of the expansion and ongoing repairs of the road infrastructure under the management of ZDMiKP in accordance with the planned investment plan in the area of the former Zachem Chemical Plant.



Action planning

The activities contained in this package are implemented on an ongoing basis, within the competence of individual units, and do not require separate planning at the level of the above document.

Details of urban investments in the field of road infrastructure are included in the city's annual investment plan. In addition, you can find information on the official website of the City of Bydgoszcz and the ZDMiKP website in Bydgoszcz.

Information on the scope and type of activities planned by BARR and BPTT can be found on their website.

Financing

Activities of individual units will be financed from their budget.

The main external source of financing are funds from the Infrastructure and Environment Operational Program

Progress of implementation

In the former Zachem, the local spatial development plan "Łęgowo - Technology Park" in Bydgoszcz is in force. A local spatial development plan "Łęgowo - Ernst Peterson" in Bydgoszcz is being prepared.

The Urban Urban Workshop is in the process of developing a change in the Study of Conditions and Directions of Spatial Development of the City of Bydgoszcz. This project indicates areas of potential occurrence of historical land and water pollution related to the activities of the former "Zachem" Chemical Plant, areas included in the register of direct threats of environmental damage and damage, and areas included in the register of historical land surface pollution. In addition, the production and service areas have a ban on the location of new plants that pose the risk of a major industrial accident.

Bydgoszcz Regional Development Agency Sp. z o.o. actively promotes investment offers located on the premises of the former Zachem Chemical Plant by publishing them in the investment offer database presented on its website

The Bydgoszcz Industrial Park continues to sell investment areas, coordinate investments and develop infrastructure in the studied area. In addition, it also offers office spaces for rent and conference rooms. Which contributes to the activation of the area.

The city of Bydgoszcz has provided the residents of Łęgowo with free connection to the municipal water supply network, for 204 properties.



References and attachments

Project studies and documents

Czop M., Irmiński W., Pietrucin D., Analiza aktualnych uwarunkowań terenów przemysłowych w Bydgosko-Toruńskim Miejskim Obszarze Funkcjonalnym - raport podsumowujący, Bydgoszcz, grudzień 2016

Czop M., Pierri D., Tour route in brownfields in Bydgoszcz-Toruń Functional Urban Area, Bydgoszcz, maj 2017

Czop M., Pietrucin D., Analysis of current situation of brownfield in FUA in „Zachem” Chemical Plant in Bydgoszcz / Poland (prezentacja ze spotkania projektowego), Magdeburg 23-24 listopada 2016

Czop M., Pierri D., Hydrogeological modeling as a tool for optimal brownfield remediation (prezentacja ze spotkania projektowego), Bydgoszcz 10 maja 2017

Dziakiewicz M. raport z przeprowadzonych badań gleby i gruntu na terenie osiedla Łęgnowo - wieś w ramach realizacji działania pilotażowego projektu GreenerSites environmental rehabilitation of brownfield sites in Central Europe Kielce, czerwiec 2019 r., DEKONTA Polska Sp. z o.o.

Kudłacik J., Otrębski A., Urbaniak M. Wytyczne metodyczne dla przeprowadzenia monitoringu środowiska gruntowo-wodnego w Bydgoszczy na terenie osiedla Łęgnowo-Wieś dla Miasta Bydgoszczy - w ramach działań pilotażowych projektu GreenerSites CE394 polegającego na badaniu wpływu zanieczyszczeń gruntu i wód gruntowych dawnych Zakładów Chemicznych „ZACHEM”, na tereny sąsiadujące. maj 2019 Arcadis

Serafin R, Gawron M., Kuczer M., Duczmal M. Model hydrogeologiczny Wrocław, maj 2019 Przedsiębiorstwo Geologiczne we Wrocławiu PROXIMA S.A

Śliwka R., Wyszowska I., Otrębski A., Urbaniak M., Michalak J., Raport z prac inwentaryzacyjnych studni indywidualnych i piezometrów zlokalizowanych na terenie osiedla Łęgnowo oraz na terenie dawnych Zakładów Chemicznych „Zachem” w Bydgoszczy, opróbowania wód podziemnych i wyników badań wykonanych w celu oceny warunków środowiskowych - w ramach działań pilotażowych projektu GreenerSites CE394 polegającego na badaniu wpływu zanieczyszczeń gruntu i wód gruntowych dawnych Zakładów Chemicznych „ZACHEM” na tereny sąsiadujące, listopad 2018, Arcadis na zlecenie Miasta Bydgoszcz

Śliwka R., Wyszowska I., Otrębski A., Urbaniak M., Michalak J., Dokumentacja geologiczna z wykonania 15 otworów obserwacyjnych (piezometrów) w celu założenia monitoringu środowiska gruntowo - wodnego w ramach działań pilotażowych projektu GreenerSites CE394 polegającego na badaniu wpływu zanieczyszczeń gruntu i wód podziemnych dawnych Zakładów Chemicznych „ZACHEM” na tereny sąsiadujące listopad 2018, Arcadis na zlecenie Miasta Bydgoszcz

Materiały szkoleniowe dotyczące zanieczyszczeń terenów przemysłowych w ramach projektu GreenerSites pn. Środowiskowa rekultywacja terenów zanieczyszczonych w Europie



Środkowej prowadzone na zlecenie Miasta Bydgoszcz przez Główny Instytut Górnictwa w Katowicach

External bibliography

Czop M., Wstępne założenia metodyczne dla potrzeb realizacji badań medycznych mieszkańców obszarów zanieczyszczonych w wyniku działalności dawnych zakładów chemicznych „Zachem” w Bydgoszczy, AGH, Kraków, kwiecień 2018

Czop M., Pierri D., Kret E. (na zlecenie RDOŚ w Bydgoszczy), Opracowanie eksperckie dotyczące znaczącego negatywnego wpływu zanieczyszczeń gruntu i wód podziemnych migrujących z obszaru dawnych Zakładów Chemicznych „Zachem” S.A. na stan jednolitych części wód: podziemnych - plgw200044 oraz powierzchniowych -PLRW20001729192 - Kanał z Łęgnowa, w tym obszarów Natura 2000 wyznaczonych w Dolinie Wisły, obejmujących w szczególności Solecką Dolinę Wisły PLH040003, i Dolinę Dolnej Wisły PLB040003, Kraków, listopad 2017

Czop M., Pierri D., Kret E., Mapa drogowa dla skutecznej likwidacji zagrożeń środowiskowych na obszarze oddziaływania dawnych zakładów chemicznych „Zachem” w Bydgoszczy, AGH, Kraków, luty 2018

Czop M., Pierri D., Kret E., Ocena skali zanieczyszczenia wód powierzchniowych i płytkich wód podziemnych w rejonie miejscowości Łęgnowo i Płatnowo, w strefie niekorzystnego oddziaływania dawnych zakładów chemicznych „Zachem” w Bydgoszczy – syntetyczny raport z realizacji projektu naukowo-badawczego Woda+, AGH, Kraków, styczeń 2018

Czop M., Pierri D., Kret E., Rekomendacje w zakresie wykorzystania wód podziemnych na obszarze osiedla Łęgnowo Wieś, projekt naukowo-badawczy Woda+, AGH, Bydgoszcz-Kraków, luty 2018

Czop M., Pietrucin D., Zanieczyszczenie wód podziemnych związkami chloroorganicznymi w rejonie składowiska odpadów przemysłowych „Zielona” w Bydgoszczy, Przegląd Geologiczny, vol. 63, nr 10/2, 2015

Czop M., Pietrucin D., Modelling of chemical migration under the overlapping impact of multiple and diverse pollution sources in the area of the “Zachem” Chemical Plant (Bydgoszcz, northern Poland), Bulletin of Geography. Physical Geography Series, No. 9 (2015): 31–38

Czop M., Pierri D., Borczak S., Warunki występowania i migracji WWA w utworach czwartorzędowych w rejonie składowiska odpadów przemysłowych „Zielona” w Bydgoszczy, Przegląd Geologiczny, vol. 65, nr 11/1, 2017

Pietrucin D., Zanieczyszczenie środowiska wodnego w rejonie składowiska odpadów przemysłowych Zielona Zakładów Chemicznych „Zachem” w Bydgoszczy, Biuletyn Państwowego Instytutu Geologicznego 456: 451–456, 2013 r.

Czop M., Pietrucin D., Kompleksowa ocena stanu zanieczyszczenia środowiska gruntowo-wodnego na terenie dawnych zakładów chemicznych „Zachem” w Bydgoszczy wraz z określeniem wykazu działań koniecznych dla skutecznej remediacji, AGH, Kraków czerwiec 2016



Czop M., Pietrucin D., Opinia merytoryczna w zakresie ustalenia mechanizmu oraz czasu wystąpienia zanieczyszczenia środowiska i/lub szkody w środowisku na terenie dawnych Zakładów Chemicznych „Zachem” w Bydgoszczy”, AGH, Kraków czerwiec 2016

Czop M., Pietrucin D., Wytyczne metodyczne dla potrzeb realizacji badań zanieczyszczenia wód podziemnych na obszarze teras Wisły i Brdy, objętych oddziaływaniem dawnych Zakładów Chemicznych „Zachem” w Bydgoszczy, AGH, Kraków marzec 2017

Internet links

<https://www.interreg-central.eu/Content.Node/GreenerSites.html>

<https://www.bydgoszcz.pl/rozwoj/projekty-miedzynarodowe/greenersites/>

<http://cob.greenersites.eu/map/>

Legal report

Bydgoszcz City Hall

ul. Jezuicka 1

85-102 Bydgoszcz

