CATALOGUE OF THE LESSONS LEARNT FROM THE PROJECT

D.T4.3.1

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Introduction

Scope of the document

This document collects the lessons learnt and good practices stemming from partners' Pilot Actions implementation and Strategic Action Plans development.

The deliverable has been elaborated under the responsibility of partner Veneto Region, based on information provided by the different project partners mainly in their Pilot Actions Reports (Deliverables D.T3.1.5, D.T3.2.4, D.T3.3.6, D.T3.4.6, D.T3.5.6, D.T3.6.6, D.T3.7.7, D.T3.8.7, D.T3.9.7, D.T3.10.5, D.T3.11.6) and in the Pilot Actions Evaluation Reports (Deliverables D.T3.12.3 and D.T3.12.5). Good Practices and Lessons Learnt emerged from these documents have been collected and arranged in a common and intuitive template.

Scope of this deliverable is to summarize in a single, easy-to-read document the different experiences and results achieved by partners during project implementation. Lessons Learnt and Good Practices are organized in order to be easily consulted and re-used according to the individual needs, favouring knowledge exchange and mutual learning within the partnership, and towards external subjects.

Structure of the document

This document is composed by two main sections, plus annexes.

The first section is dedicated to the Lessons Learnt, whereas this term is used to indicate experiences, distilled from project activities that should be actively taken into account in the replication or continuation of similar activities in the future. Using a commonly accepted definition "A lesson learnt is knowledge or understanding gained by experience".

The subsequent section is dedicated to Good Practices applicable to brownfield remediation interventions. A good practice can be defined as a method or technique that results to be feasible and effective in a given context for the achievement of certain goals. For each Good Practice, the partner that developed or tested it and the related Pilot Action are indicated: interested subjects can refer to them and to specific project deliverables for technical details.7

In the annexes, the empty templates used for describing Lessons Learnt and Good Practices are reported.

Lessons Learnt

The implementation of GreenerSites Pilot Actions provided to both partners and other involved stakeholders a lot of hints and valuable experiences. Here the most general and transferable Lessons Learnt are summarised, to be diffused and taken into consideration in future brownfields remediation projects.

List of considered Lessons Learnt:

- LL-01 Importance of involving the stakeholders and the local communities
- LL-02 Importance of involving different departments and competencies
- LL-03 Importance of both internal and external communication
- LL-04 Importance of appropriate team and project management skills
- LL-05 Need for increasing skills and know-how of the public sector in brownfield management
- LL-06 Usefulness and effectiveness of including training for entrepreneurs and site owners in the training measures
- LL-07 Possibility to appoint a figure responsible for the management of brownfields
- LL-08 Need to pay attention to the economic dimension in brownfield management
- LL-09 Need to pay attention to timing and length of administrative procedures
- LL-10 Importance to have access to reliable data of the sites
- LL-11 Tendency to overestimate the risk when using transport models for air quality assessment **Errore. Il segnalibro non è definito.**
- LL-12 Possibility to test innovative solutions in site remediation

LL-01	Importance of involving the stakeholders and the local communities	
Interested scope	Intervention Design	Intervention Implementation
	Technical elements	Communication
	Economic & financials aspects	Timing
	Administrative & regulatory asp.	Other:

Task Addressed	Involvement of Stakeholders and Local Communities.
What happened / How the topic was addressed	Consultation with key stakeholders and members of local communities was a common feature in most part of Pilot activities, and is one of the pillars of the GreenerSites project itself. Moments specifically dedicated to meet and discuss with stakeholders were explicitly foreseen at the beginning of the project (planning phase), during Pilot Actions implementation, and then for the definition of the Strategic Action Plans in all urban areas.
What worked well and what could be improved	Stakeholders' involvement is a long process that requires creating commitment and consensus around common goals or challenges. For this reason, the possibility to exploit existent and consolidated relations or the capability to activate proper communication channels are essential to achieve a real and active involvement of stakeholders and local communities. On the other hand, this involvement can be very positive for a project, providing access to different expertise and points of view, and creating the conditions for greater acceptability and long-term sustainability of any intervention.
Additional comments	Particular attention must be dedicated to area owners: the contact with owners has to take place early, to avoid delays in the project processing. This is important because clarifying data protection issues can be time consuming. It is recommended to maintain and follow up the contacts on a regular basis.

LL-02	Importance of involving different departments and competencies	
Interested scope	Intervention Design	Intervention Implementation
	Technical elements	Communication
	Economic & financials aspects	Timing
	Administrative & regulatory asp.	Other:

Task Addressed	Ensure smooth implementation of project activities.
What happened / How the topic was addressed	Brownfields regeneration is a complex process with an impact on several different dimensions and different level of governance. For this reason, coordination of intents and joint commitment of different actors is essential.
What worked well and what could be improved	According to project experience, it's important to involve in the process different actors at different levels of governance with particular attention to the public authorities having competence on the area and, within them, different thematic departments (i.e. urban development, economics, environment, etc.). These different actors should be involved as early as possible, and should play an active role in the process implementation. To this end, increasing qualification of personnel within the administration (i.e. through proper training activities, see LL-05) can be an effective strategy, since qualified personnel with specific responsibilities can promote processes better. The most relevant thematic sectors to be involved depends from the topics and goals of the project to be implemented.
Additional comments	

LL-03	Importance of internal and external communication	
Interested scope	Intervention Design	Intervention Implementation
	Technical elements	Communication
	Economic & financials aspects	Timing
	Administrative & regulatory asp.	Other:

Task Addressed	Ensure fluent implementation of project activities.
What happened / How the topic was addressed	Various actors were involved in all project activities as highlighted in LL-02. For this reason, it resulted important to organize regular communications and technical meetings among the different involved subjects, to ensure coordination and a fluent implementation of project activities.
What worked well and what could be improved	In the case of Veneto Region Pilot Action, for example, the adequacy of coordination methods and meetings allowed to overcome the obstacles that often stem from the administrative limits. In addition, the internal communication managed to balance the necessity of having good timeliness with the timing of formal communications. The importance of external communication also emerged during Pilot Actions, to boost the creation of a supportive environment, ensure sustainability, and also for promoting replication.
Additional comments	

LL-04	Importance of appropriate team and project management skills	
Interested scope	Intervention Design	Intervention Implementation
	Technical elements	Communication
	Economic & financials aspects	Timing
	Administrative & regulatory asp.	Other:

Task Addressed	Ensure smooth implementation of project activities.
What happened / How the topic was addressed	Given the complexity of the topic and the uniqueness of each brownfield, the risk of facing unforeseen events and consequent delays has to be taken into consideration. For this reason, the expertise of the team coordinating the intervention is very important.
What worked well and what could be improved	Considering the complexity of the topic, the fact that many different competencies and actors are involved, the need for effective internal and external communication, and also the importance of time management, activities coordination should be ensured by experienced professionals. Moreover, the deployment of a multi-skilled team is recommended, covering at least the following three main fields: project management, technical competencies, communication & public relations. A specific training to the team in the phases before the start of the activity could be of help.
Additional comments	

LL-05	Need for increasing skills and know-how of the public sector in brownfield management	
Interested scope	Intervention Design	Intervention Implementation
	Technical elements	Communication
	Economic & financials aspects	Timing
	Administrative & regulatory asp.	Other: Training

Task Addressed	Need for increasing skills and know-how of the public sector in brownfield management
What happened / How the topic was addressed	Training on project-related topics was organized by all partners at local and transnational level through traditional training sessions and international study visits. Common training framework and materials were produced at consortium level, then customized according to local needs and priorities.
What worked well and what could be improved	These trainings were addressed to public employees and local stakeholders, to increase their capacity to effectively manage brownfields regeneration in a sustainable way. Different training topics and methodologies have been used. Venice Municipality, for example, together with the Veneto Region and the North Adriatic Port Authority, organized four thematic training sessions with external trainers, focused on: environmental legislation; sustainable remediation technologies; analysis of the atmosphere pollution caused by the underground; local marketing strategies for brownfields. In Bydgoszcz the training materials and lectures were prepared and conducted by experts from the Central Mining Institute in Katowice. Trainings included presentations, lectures, case studies and practical examples of issues related to polluted areas grouped in thematic panels: Law, Health Risk, Remediation Technologies, Research in Practice, Geo information, Pollution Migration. In addition, delegates from partner organizations participated in two transnational training sessions and in 3 study-visits, in France, Germany and Austria.
Additional comments	The practice directly contributed to increase both awareness and commitment of involved persons towards project topics and is thus recommended also for future applications.

LL-06	Usefulness and effectiveness of including training for entrepreneurs and site owners in the training measures	
Interested scope	Intervention Design	Intervention Implementation
	Technical elements	Communication
	Economic & financials aspects	Timing
	Administrative & regulatory asp.	Other: Training

Task Addressed	Need to increase awareness and competencies of private site owners and investors
What happened / How the topic was addressed	Some of the partners involved in training activities not only public officials, but also entrepreneurs, owners of polluted areas and investors. The purpose was to familiarise these people with brownfield remediation topics, and to increase their capability to exploit these areas in accordance with the principles of sustainable development.
What worked well and what could be improved	The outcome of the trainings shows that there is a very high demand for improving competence and exchange of knowledge, also among private operators, since a better knowledge on the state of their land and nearby areas, but also on what can be done and how this affect possible future usages, is essential for them. The possibility to show examples and solutions from other countries was a strength point of the training, since it gave a wider perspective about the brownfield development in Europe and resulted in a better understanding of local problems. As for training organization, partners experience indicates that needs and concerns of private operators differ from institutions, therefore the possibility to organize separate training activities would allow to better adapt subjects to specific needs of entrepreneurs. On the other hand, common training allows them to meet representatives of public authorities on a neutral ground, and resulted to be very effective for knowledge exchange and for boosting public-private dialogue on considered issues. The most effective solution is thus probably to organize a common training activity, with separate sessions on specific topics.
Additional comments	

LL-07	Possibility to appoint a figure responsible for the management of brownfields	
Interested scope	Intervention Design	Intervention Implementation
	Technical elements	Communication
	Economic & financials aspects	Timing
	Administrative & regulatory asp.	Other:

Task Addressed	Ensure effective design and implementation of remediation interventions.
What happened / How the topic was addressed	When talking about remediation and reuse of brownfields, the support of local administrations is essential. During the implementation of their Pilot Actions some of the partners directly experienced how a change in the local government or in the management boards of key institutions can strongly influence the whole implementation process, causing a slowdown of the scheduled realizations and sometimes unclear instructions on which directions to head.
What worked well and what could be improved	Starting from such experience the idea came to create a specific figure to support the local administrations with the management of brownfields. This idea was tested also by the City of Bydgoszcz in a the COBRAMEN project – Interreg CE 2007 - which created a new job profile, the brownfield manager, to facilitate and steer brownfield revitalisation processes. A similar figure could help to increase the competences (technical, regulatory and financial) of the local administration and to keep the road also in case of changes in the administration composition.
Additional comments	

LL-08	Need to pay attention to the economic dimension in brownfield management	
Interested scope	Intervention Design	Intervention Implementation
	Technical elements	Communication
	Economic & financials aspects	Timing
	Administrative & regulatory asp.	Other:

Task Addressed	Ensuring proper resources and funding for interventions implementation.
What happened / How the topic was addressed	The research and use of funding opportunities is an essential element to ensure feasibility of site reconversion projects. For this reason, it's important that all actors focus on the economic dimension during all phases of intervention planning, design and implementation.
What worked well and what could be improved	All the different possible funding sources should be taken into consideration. These need not be limited to promoting investment. Funding opportunities for intensive cooperation between relevant actors and the promotion of exchange can be of central importance for remediation interventions. An interesting note not to be ignored: Pilot Action experience highlighted that the development of greenfields and brownfields are in competition with each other. The steady development of greenfields can lead to a reduction in prices and demand for brownfields. This contradicts the overall goals of a vibrant and environmentally friendly community and has to be taken into due consideration when defining development plans at FUA level.
Additional comments	

LL-09	Need to pay attention to timing and length of administrative procedures	
Interested scope	Intervention Design	Intervention Implementation
	Technical elements	Communication
	Economic & financials aspects	Timing
	Administrative & regulatory asp.	Other:

Task Addressed	Ensure fluent implementation of project activities.
What happened / How the topic was addressed	When dealing with complex, multi-actors projects, particular attention has to be put on timing and scheduling. However, various Pilot Actions highlighted that, in case of brownfields, additional difficulties and delays could be caused by lack or unavailability of data, length of administrative procedures, uncertainty, complexity or overlapping of regulations and responsibilities, lack of clear standards, targets or previous similar experiences.
What worked well and what could be improved	During the implementation of the Pilot Actions direct internal communication and the high commitment of the different actors involved helped partially to overcome the obstacles that often stem from the administrative limits. From this point of view, the collaboration among different subjects in the activities implementation was positive. However, the length and complexity of certain procedures should be taken into due consideration during project planning phase and regularly monitored during project implementation.
Additional comments	

LL-10	Importance to have access to reliable site data	
Interested scope	Intervention Design	Intervention Implementation
	Technical elements	Communication
	Economic & financials aspects	Timing
	Administrative & regulatory asp.	Other:

Task Addressed	Availability and accessibility of data on the brownfields.
What happened / How the topic was addressed	Availability of complete and reliable data on a site is essential for both identifying appropriate remediation and rehabilitation strategies and for interventions implementation. However, various Pilot Actions highlighted that these data are not always available, nor easily accessible.
What worked well and what could be improved	In some cases, the involvement of the right subjects (ex. site owners, monitoring agencies etc.) in project working group resulted to be essential to have access to site data. In other cases, data were available, but not in a common and comparable format, thus further studies and analysis were needed. For the future, greater attention in data collection and in the usage of common / unified standards (at least for the same territory) is recommended. This would be very important for supporting brownfield remediation interventions.
Additional comments	

LL-11	Tendency to overestimate the risk when using transport models for air quality assessment	
Interested scope	Intervention Design	Intervention Implementation
	Technical elements	Communication
	Economic & financials aspects	Timing
	Administrative & regulatory asp.	Other:

Task Addressed	Improve precision and effectiveness of air quality monitoring in unused areas subject to remediation interventions.
What happened / How the topic was addressed	The MLE (multiple line of evidence) approach has been applied in Marghera Pilot Site, to discriminate the contribution to air pollution due to contamination of the subsoil with respect to contributions from widespread sources and production activities.
What worked well and what could be improved	The MLE approach resulted to be more precise than normal transport models and widely applicable in contaminated areas. Therefore, it can be used to better calibrate the remediation interventions that are actually needed in a specific site. The Project Pilot activity demonstrated that transport model normally overestimates the contamination level and risks. The overestimation regards the first phase of the volatilization process (from liquid to soil-gas): for the majority of soil-gas analysed the concentration measured through the model is higher than the one measured in the field. This means that a remediation intervention designed on the basis of transport models results is probably more complex and more expensive than what would be really needed in that specific site.
Additional comments	The test also highlighted that, in general, also in brownfield sites only a small part of the air contamination is imputable to soil-gas: external sources (i.e. productive activities) are more consistent.

LL-12	Possibility to test alternative solutions in site remediation	
Interested scope	Intervention Design	Intervention Implementation
	Technical elements	Communication
	Economic & financials aspects	Timing
	Administrative & regulatory asp.	Other:

Task Addressed	Re-use of large, highly polluted areas.
What happened / How the topic was addressed	There are cases, like the Stara Cinkarna brownfield in Celje, in which trying to ensure a complete cleaning of the site is practically impossible, especially when considering the necessary amount of money, time and the technical difficulties. In such cases, the risk is that, due to the complexity of required procedures, nothing is done and the site remains as it is. On the contrary, the Celje Pilot Action demonstrated that there are environment friendly and cost-effective methods that can be used to decrease the impact of brownfields to the environment and ensure future use of the location.
What worked well and what could be improved	Three different cost and environmental effective remediation methods have been tested and validated in Stara Cinkarna brownfield: 1. Remediation with calcareous paper ash 2. Remediation with cold recycling 3. Preparation of suitable mixture of organo-mineral substrate
Additional comments	

Good Practices

For the purposes of this document, Good Practices are methods or techniques that resulted to be feasible and effective in a given context for the achievement of certain goals, related to brownfield sites remediation and reuse.

In this chapter, 12 Good Practices validated through the GreenerSites Pilot Actions are reported. For each Good Practice, the partner that developed or tested it and the related Pilot Action are indicated: interested subjects can refer to them and to specific project deliverables for technical details.

List of GreenerSites Good Practices:

- GP-01 A holistic approach for analysing, assessing and re-thinking brownfields
- GP-02 Identification of most valuable, sustainable and cost-effective remediation methods for a specific area
- GP-03 Social participation processes
- GP-04 Use of Multiple Lines of Evidence (MLE) approach to correctly assess the risk associated with the inhalation of vapours from the subsoil in polluted areas
- GP-05 Optimized soil and water monitoring for long-term maintenance of remediation effects
- GP-06 Assessing the impact of former chemical plant on residential area
- GP-07 Remediation with calcareous paper ash
- GP-08 Remediation with cold recycling
- GP-09 Preparation of suitable mixture of organo-mineral substrate
- GP-10 Re-use of excavated not-polluted soil to consolidate a former industrial flooring
- GP-11 Environmental capping
- GP-12 GreenerSites Web-GIS

GP-01	A holistic approach for analysing, assessing and re-thinking brownfields	
Interested scope	Intervention Design	Intervention Implementation
	Technical elements	Communication
	Economic & financials aspects	Timing
	Administrative & regulatory asp.	Other:

Topic / Task Addressed	Definition of a brownfield revitalisation strategy and linked effective environmental management processes.
Proposed Good Practice	During the project Pilot Activity in Halle, an integrated and transferable methodology was developed for the co-planning and co-design of remediation strategies for local brownfields. The implemented methodology is composed by a series of steps that can be transferred and replicated in similar contexts.
Short description	Proposed methodology is composed by the following steps: • Joint selection of relevant brownfield sites for potential development on the basis of the site information system; • Drawing up a questionnaire to involve owners and to increase the knowledge about the brownfield sites; • Surveys/interviews with brownfield site owners and analysis of the replies to the questionnaire; • Desktop research and data collection to complete missing data in the site information system; • Analysis of brownfield features (e.g. owner situation, construction and planning law regulations, infrastructure, geology, hydrology, and settlement structure); • Prioritisation of brownfield sites according to their positive and adverse determinants; • Use of a common and transferable methodology for brownfields analysis and assessment; • Individual assessment of each selected brownfield site; • Presenting possible solutions to face adverse determinants (e.g., removal of vegetation, remediation of contaminated sites, clearing of sites suspected to be contaminated with unexploded ordnance, risk assessment from the former mining operations); • Elaboration of final recommendations of action for the area.
Additional comments	

Good Practice source & further details			
Partner	ISW	Contact	
Relevant Pilot Action	Brownfield revitalisation strategy after remediation activities		

GP-02	Identification of most valuable, sustainable and cost-effective remediation methods for a specific area	
Interested scope	Intervention Design	Intervention Implementation
	Technical elements	Communication
	Economic & financials aspects	Timing
	Administrative & regulatory asp.	Other:

Topic / Task Addressed	Identification and planning of sustainable remediation interventions in a contaminated area.
Proposed Good Practice	A methodology to compare different available remediation technologies and identify the most suitable and sustainable ones for a specific contaminated area has been developed. This includes a list of sustainability indicators and the method of assessing them.
Short description	The work carried out by the City of Venice consisted in the definition of a new method to select the most appropriate available technologies in order to clean up contaminated sites. This method is based on three fundamental aspects: the best remediation technologies with respect to the contaminants, the current regulation framework and the degree of sustainability of the remediation. The sustainability evaluation of the intervention was developed and based both on the methods proposed by Surf UK (United Kingdom's Sustainable Remediation Forum) and ISPRA (Italian Institute for Environmental protection). The final outcome gives some technical guidelines for the planning of new remediation interventions in contaminated sites or in the revising of existing ones. This method can be applied to any site in any territory
Additional comments	

Good Practice source & further details			
Partner	Venice Municipality	Contact	
Relevant Pilot Action	Linking remediation strategies to the need for future productive settlements		

GP-03	Social participation processes	
Interested scope	Intervention Design	Intervention Implementation
	Technical elements	Communication
	Economic & financials aspects	Timing
	Administrative & regulatory asp.	Other:

Topic / Task Addressed	Local communities involvement and participation during intervention planning and/or implementation phases.
Proposed Good Practice	In dealing with the deep social exclusion of the area inhabitants and their supposed negative attitude, ARM SA had to pay particular attention to the dialogue with the local community for the implementation of its Pilot Action. The adopted solution included a combination of different methods and an innovative, very demanding Planning for Real method (PFR). This approach gave great results and the inhabitants of the social buildings neighbouring the brownfield, willingly cooperated and showed great commitment to the planned changes.
Short description	Public consultations were conducted with the residents of three housing estates located near the degraded area. The “Planning for Real” approach was also used, and consisted of a method that helped support the communities to identify issues in their neighbourhoods whilst working together in partnership with decision makers to think about ways to change or improve their neighbourhood. The consultation process was summarized in the document called “Report on the process of social participation regarding the post-industrial area at Energetyków Street in Radom”, which has become an excellent public participation guide and a set of best practices in community involvement process.
Additional comments	

Good Practice source & further details			
Partner	Mazovia Development Agency, Plc (ARM SA)	Contact	
Relevant Pilot Action	Brownfield regeneration strategy based on public participation process		

GP-04	Use of Multiple Lines of Evidence (MLE) approach to correctly assess the risk associated with the inhalation of vapours from the subsoil in polluted areas	
Interested scope	Intervention Design	Intervention Implementation
	Technical elements	Communication
	Economic & financials aspects	Timing
	Administrative & regulatory asp.	Other:

Topic / Task Addressed	Ambient air and soil gas monitoring in unused areas, in order to identify and plan the necessary remediation interventions.
Proposed Good Practice	The estimation of the exposure to the vapours coming from the subsoil using a multiple lines of evidence approach leads to a more realistic and less conservative risk assessment, allowing a better calibration of remediation goals. The selected approach helped to distinguish the subsurface sources contribution to air pollution with respect to contributions from widespread sources, like anthropogenic background levels or productive cycles. Moreover, the sampling surveys carried out in the field test sites highlight the strong influence of the dynamics at the soil-atmosphere interface on the volatile compounds concentrations in soil gas and air. They show the importance of differential pressure measurement between those two matrices for the correct interpretation of the monitoring results.
Short description	In the MLE approach, the risk assessment derives from the joint evaluation of the results of the different types of measurements (lines of evidence), each of which is characterized by a different degree of uncertainty and relevance for the purpose of estimating exposure to toxic substances. In the specific case, ARPAV carried out three surveys based on soil gas and ambient air monitoring and flux chamber measurements. A new campaign with additional line of evidence represented by passive sampling methods (i.e. passive soil gas sampler) is likely to be carried out within the end of the project. These innovative techniques do not alter the subsoil (as the aspiring techniques) and also have a lower cost.
Additional comments	The advantages of the MLE approach are several, for instance the reduction of the degree of overall uncertainty associated with the estimation risk, the assessment of the suitability of transport models (through a comparison between concentrations measured and estimated) so models can be better calibrated, discriminations of the background values through concentration ratios as well as a better comprehension of the specific site's model.

Good Practice source & further details			
Partner	Veneto Region	Contact	
Relevant Pilot Action	Monitoring of the air quality in brownfields subject to remediation		

GP-05	Optimized soil and water monitoring for long-term maintenance of remediation effects	
Interested scope	Intervention Design	Intervention Implementation
	Technical elements	Communication
	Economic & financials aspects	Timing
	Administrative & regulatory asp.	Other:

Topic / Task Addressed	Need to establish a soil and water monitoring system for long-term maintenance control of the remediation techniques undertaken.
Proposed Good Practice	An extensive monitoring campaign combined with data obtained from additional drillings, results of geophysical analysis and tests with carbon nano-particles. The analyses carried out in a specialised laboratory provided valuable information for the target area and also allowed for determining of the location, span and thickness of a passive nano-carbon barrier for improving remediation interventions.
Short description	The following activities were carried out as part of environmental monitoring: • Uptake of groundwater samples for laboratory analysis of PAH and BTEX content – in total 72 probes in 6 measurement campaigns, • Measurement of PAH and BTEX content using passive samplers in key wells and piezometers - in total 100 passive samplers were used, • Uptake of soil and subsoil samples for laboratory analyses of PAH and BTEX content – in total 82 samples were analysed in two measurement campaigns, • 10 monitoring points were placed in total, extending groundwater monitoring network. Drillings (18 pieces) were carried out till depth of approx. 15-22 meters to define the depth and type of aquitard, • 2 mega-samples of soil (20 kg) and 1 mega-sample of water (20 litres) were uptaken to carry out laboratory tests on effectiveness of sorption of pollutants by nano-carbon particles, • Sorption tests were carried out in a specialised laboratory in the USA, • A network of geophysical measurements was planned and geophysical research was carried out. Thanks to the obtained results geological structure was defined, • 6 periodic reports from laboratory analysis and one final report were developed.
Additional comments	

Good Practice source & further details			
Partner	Municipality of Solec Kujawski	Contact	
Relevant Pilot Action	Optimisation of soil and water monitoring for long-term maintenance of remediation effects		

GP-06	Assessing the impact of former chemical plant on residential area	
Interested scope	Intervention Design	Intervention Implementation
	Technical elements	Communication
	Economic & financials aspects	Timing
	Administrative & regulatory asp.	Other:

Topic / Task Addressed	Assessing the environmental condition and the impact of brownfield site for residential area.
Proposed Good Practice	A preliminary ground and ground water tests and analysis of the impact on residential area Łęgnowo Wieś accompanied by hydrogeological modelling of contamination migration. The activities allowed to determine the risk for human health and define guidelines for future monitoring necessity.
Short description	The following activities were carried out: 1. Inventory of existing piezometers and wells, including the determination of location coordinates, measurements of technical parameters of piezometers, groundwater field measurements and conducting surveys in the field of usability of wells. In addition, groundwater from selected wells located in both the residential and the industrial areas was collected and analysed. Installation of new piezometers; collection and analysis of ground water samples; creation of a hydrogeological model of groundwater and pollutants flow from the former industrial area to the residential estate 2. Risk analysis for human health: a soil sampling plan was developed for the residential area to assess health risk for the inhabitants. Sampling plan was developed in compliance with national regulations, taking into account cartographic data and the findings of the previous investigations. The residential area (31.1 ha) was divided into 20 sampling sections taking into account the location of groundwater pollution clouds and a topographic relief. The location of 9 bore-holes was determined with the coordinates representing the central points of the selected plots. Substances for health risk analysis were selected by assigning appropriate sources and types of pollution to each cloud. 3. Guideline for monitoring: a plan for the ongoing observation of the inflow of groundwater pollution migrating from the former industrial area towards the residential area was defined, in the context of the impact assessment on the residents of the housing estate. In total, the planned research network of groundwater monitoring will include 28 observation points, plus the monitoring of water quality in both farm wells and in surface waters. The GreenerSites Web-GIS tool will also be used to create a database by means of which the residents and other parties have access to current information on the results of monitoring work through the web browser.

Additional comments	There are few laboratories that test site specific contaminants in ground and groundwater. There are also no defined levels in most of the European countries. In Bydgoszcz pilot site following organic ingredients were tested: Total Organic Carbon (TOC), Phenol, Aniline, components BTEX (Benzene, Toluene, Ethylobenzene, Xylene), Diphenylsulphone, Chloroaniline, Epichlorohydrin, Hydroxybiphenyls, Nitrobenzene or total of nitro compounds, Octylophenole, Toluenodiamine, Toluidine, total PAH, total AOX and PCE i TCE.

Good Practice source & further details			
Partner	City of Bydgoszcz	Contact	h.lewandowska@um.bydgoszcz.pl
Relevant Pilot Action	D.T.3.9 Ground and groundwater monitoring in the inhabited area near brownfield site		

GP-07	Remediation with calcareous paper ash	
Interested scope	Intervention Design	Intervention Implementation
	Technical elements	Communication
	Economic & financials aspects	Timing
	Administrative & regulatory asp.	Other:

Topic / Task Addressed	Methods / procedures for the remediation of contaminated soil.
Proposed Good Practice	The method is performed by mixing contaminated soil with a suitable additive, whereby potentially toxic elements by means of chemical and physical mechanisms, are transformed into low mobile, non-bioavailable and non-toxic chemical species.
Short description	Scientific studies show that calcareous paper ash from the paper industry is a very promising immobilization additive. It consists of the hydraulic active minerals, which form new mineral phases, when they are in contact with water. This leads to the formation of a bonded matrix suitable for immobilization. Within the scope of this study, the soil sample from the Old Zinc-Works site was first sieved, grains larger than 16 mm were then crushed and the sample was homogenized. Paper ash produced by VIPAP VIDEM KRŠKO, d.d. was used as an additive. A geotechnical composite was prepared, with contaminated soil and paper ash, at a dry mass ratio of 3: 1. Modified Proctor procedure according to SIST EN 13286-2: 2010/AC, was performed, to obtain the optimum moisture content and the reference maximum dry density of the composite, which were 19.3% and 1.54 Mg/m3, respectively. Tests showed that average unconfined compressive strength of the composite test samples, after 28 days of curing, was inert.
Additional comments	The results of the study had shown that the described method is effective because obtained composite is inert and is suitable for the construction of embankments or fills for the rehabilitation of this degraded area. It could be used for the preparation of inert cover of the polluted area thus preventing the migration of pollutants to underground water or the dusting of polluted soil.

Good Practice source & further details			
Partner	Municipality of Celje	Contact	
Relevant Pilot Action	Analysis and comparison of different remediation methods and related costs		

GP-08	Remediation with cold recycling	
Interested scope	Intervention Design	Intervention Implementation
	Technical elements	Communication
	Economic & financials aspects	Timing
	Administrative & regulatory asp.	Other:

Topic / Task Addressed	Methods / procedures for the remediation of contaminated soil.
Proposed Good Practice	Cold recycling technology is an environmentally friendly and economical method to produce new quality load-bearing layers, thus eliminating the cost of excavation and consequently disposal of it, and the costs of preparing and transporting new material. Finishing sealing layer is made of waterproof membrane that prevents dusting and leaking of pollutants to underground water. Additionally, the finishing sealing layer may be covered with 30 cm of previously analysed ground layer (10.8 m3), upgraded with grass sowing (red fescue, cat grass, sheep fescue).
Short description	Contractors conducted an attempt to remediate the contaminated soil in the pilot area of the "Stara Cinkarna" with the crushed stone 0/32 mm (buffer layer) in a thickness of 30 cm (concentrated state) and the implementation of cold recycling (WIRTGEN WR 250) with cement and foamed bitumen at a depth of 25 cm. This makes bitumen cement stabilization, while the contaminated layer remains covered and intact. In this way, it is impossible to raise dust, heavy metals and dangerous substances into the atmosphere.
Additional comments	The advanced watertight containment barrier represents an innovative and comprehensive approach to the implementation of the remediation process in industrial degraded areas where the cold recycling process does not interfere with critical contaminated soil and requires relatively low installation of the composite for the construction of a barrier (30-35 cm). Also, the proposed approach is environmentally most acceptable, since a product, which is the integrated composite, can be fully recycled.

Good Practice source & further details			
Partner	Municipality of Celje	Contact	
Relevant Pilot Action	Analysis and comparison of different remediation methods		

GP-09	Preparation of suitable mixture of organo-mineral substrate	
Interested scope	Intervention Design	Intervention Implementation
	Technical elements	Communication
	Economic & financials aspects	Timing
	Administrative & regulatory asp.	Other:

Topic / Task Addressed	Methods / procedures for the remediation of contaminated soil.
Proposed Good Practice	A mixture of organic and mineral components can be used to create an active substrate to be put over the contaminated soil, where to grow plants and vegetables. To be effective, the right mixture of ingredients for the active substrate must be used.
Short description	In project Pilot Activity, to determine the appropriate mixture of ingredients for the active substrate, a pot experiment was carried out under controlled conditions in a glasshouse. Three hyperaccumulator plants were used as test plants, due to their affinity for heavy metals: ribwort plantain (Plantago lanceolata L.) and two vegetables, known to take up heavy metals by absorbing them from contaminated soils, lettuce (Lactuca sativa L.) and carrots (Daucus carota subs. Sativus). Ribwort Plantain is the test (fitoaccumulation) plant for soil contamination research in Slovenia, as for vegetables, very strict criteria are set for the level of heavy metals in food. All three plants were represented in pots in the same proportion. Five different mixtures of the active substrate were composed from: i) organic component –municipal compost; ii) mineral component - unpolluted, silty-clay soils, and iii) Zeolite powder. Analysis showed that the substrate mixtures suitable for soil remediation of the Stara Cinkarna area are: 10:40:50 and 10: 50:40 (zeolite: mineral component: organic component), according to the accumulation of heavy metals in test plants. Although heavy metals were detected in the plants we used, the content was below the threshold value, what means that this compost is suitable for use in urban gardens.
Additional comments	By using organo-mineral substrate and greening the degraded and contaminated areas, it is also possible to reduce the risks associated with land contamination. In particular, it would limit wind velocity (wind erosion) and thus inhaling heavy metal particles, direct ingestion and skin contact. Remediation would also contribute to reducing heavy metal contamination of ground water as well as above ground water and thus the transfer of heavy metals to other parts of environment and indirectly to human again.

Good Practice source & further details			
Partner	Municipality of Celje	Contact	
Relevant Pilot Action	Analysis and comparison of different remediation methods		

GP-10	Re-use of excavated not-polluted soil to consolidate a former industrial flooring	
Interested scope	Intervention Design	Intervention Implementation
	Technical elements	Communication
	Economic & financials aspects	Timing
	Administrative & regulatory asp.	Other:

Topic / Task Addressed	Re-use of excavated not-polluted soil to consolidate soil.
Proposed Good Practice	Re-use of excavated not-polluted soil in the so-called Montesyndial area to consolidate soil during a reconversion intervention, thus minimising transportation of clean material from e.g. quarry.
Short description	Functional to the development of the capping (i.e. the Relevant Pilot Action mentioned in the last line of this form), there was the realisation of a layer made of not-polluted soil, in particular in two areas, one with and one without drainage system. Within the initial pilot project activities, an environmental survey plan as well as a geotechnical/geognostic survey plan was developed and therefore carried out with collection and analysis of related results. Then, the area has been cleared from grass and bushes and not-polluted soil has been excavated from nearby sites. A layer made of not-polluted soil was realized, and monitoring devices (e.g. settlement gauges in steel) have been installed.
Additional comments	The final aim was to consolidate the soil over which an environmental capping will be realized for a container terminal, that is foreseen to be built.

Good Practice source & further details			
Partner	North Adriatic Sea Port Authority	Contact	
Relevant Pilot Action	Test of a more environmental friendly and cost effective way to provide the capping		

GP-11	Environmental capping	
Interested scope	Intervention Design	Intervention Implementation
	Technical elements	Communication
	Economic & financials aspects	Timing
	Administrative & regulatory asp.	Other:

Topic / Task Addressed	Need to interrupt the pathways of contaminants in the underground water sources and also to provide statics quality to the flooring to be constructed.
Proposed Good Practice	Realisation and test of a more environmental friendly and cost effective way of providing capping.
Short description	The pilot project aimed at testing a more environmental friendly and cost effective way of providing capping in the so called Montesyndial area. The final aim was to check the stability of the soil over which the environmental capping will be realized where NASPA foresees to build a container terminal. Functional to the development of the capping, there was the realization and test of a "layer made of not-polluted soil", described in the form above. The **main scope** of the capping is to interrupt the pathways of **contaminants** and also to provide statics to the container terminal surface pavement. A preparatory study was developed in 2017 which consisted in geognostic/geotechnical and environmental analyses the results of which were necessary to plan, develop and test the capping. Then, after the realisation of a layer made of not-polluted soil in two areas, and installation of monitoring devices (e.g. settlement gauges in steel), a drainage system was installed on one of the two above mentioned areas. Finally, the environmental capping, necessary for the detailed design of the container terminal was realized.
Additional comments	NASPA pilot action represents a sustainable solution according to the following considerations: • Capping is considered to be one of the available remediation technologies by ISPRA - the Italian Environmental Protection Agency (adapted and based on Matrix developed by the Federal Remediation Technologies Roundtable); • In the NASPA specific case, this technology will be adopted in combination with other in situ remediation technologies in the Ex MonteSyndial site (90 hectars). It aims at interrupting the pathways of contaminants; • Reusing in-situ not polluted soil made the approach

	environmental friendly (less transports, and so less CO2 production) and cost effective.

Good Practice source & further details			
Partner	North Adriatic Sea Port Authority	Contact	
Relevant Pilot Action	Test of a more environmental friendly and cost effective way to provide the capping		

GP-12	GreenerSites Web-GIS	
Interested scope	Intervention Design	Intervention Implementation
	Technical elements	Communication
	Economic & financials aspects	Timing
	Administrative & regulatory asp.	Other:

Topic / Task Addressed	IT tool supporting data sharing, spatial analysis and collaboration in brownfield remediation projects.
Proposed Good Practice	The GreenerSites Web GIS tool is a spatial information system that enables on-line cooperation among public administration authorities and other entities involved in and related to the rehabilitation and management of brownfields. Its basic functions are data sharing, a map viewer, a search engine and the ability to create and export fact sheets.
Short description	It is a Web GIS application based on open source technologies. The system includes basic maps and orthophotos, as well as selected thematic maps and other geodata as required in a specific project. The tool meets the OCG (Open Geospatial Consortium) standards and is thereby fully interoperable with the common interfaces for web services based on the INSPIRE directive. The tool is a ready-to-use application, even if it still requires some technical operation preconditions as well as specific administration competencies. It allows data storing and sharing, and can be used for supporting analysis, the implementing of the interventions, decision-making and marketing purposes.
Additional comments	The GreenerSites Web GIS tool is not a centrally operated application and database. It is designed to be used locally and temporarily to support a certain project. Thus different local versions of the tool can exist. The tool can be operated openly or through internet password protection, or again internally via the intranet of a specific institution.

Good Practice source & further details			
Partner	Ministry of Regional Development and Transport Saxony Anhalt	Contact	
Relevant Pilot Action	Implementation of the GreenerSites Web-GIS tool		

ANNEX - Templates

Lessons Learnt Template

LL-xx	**(Lesson Learnt title)**	
Interested scope	Intervention Design	Intervention Implementation
	Technical elements	Communication
	Economic & financials aspects	Timing
	Administrative & regulatory asp.	Other:

Task Addressed	
What happened / How the topic was addressed	
What worked well and what could be improved	
Additional comments	

Good Practices Template

GP-xx	(Good Practices title)	
Interested scope	Intervention Design	Intervention Implementation
	Technical elements	Communication
	Economic & financials aspects	Timing
	Administrative & regulatory asp.	Other:

Topic / Task Addressed	
Proposed Good Practice	
Short description	
Additional comments	

Good Practice source & further details			
Partner		Contact	
Relevant Pilot Action			