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Revitalization of brownfields in St. Petersburg – development of a methodology under the aspect of remediation of contaminated sites by the example of the Konjushennaja Square

The project REVVIN “Scientific Approach for the Economic and Socially Compatible Revitalization of Brownfields in St. Petersburg” deals with the sustainable development and the recovery of former industrial sites in the Russian metropolis. The big challenge for the city of St. Petersburg is to transform the historical city centre as well as the industrial belt connected to it.

As, in particular, these areas involve enormous possibilities to sustainably reform the existing structures of the city without utilizing new areas in the outskirts.
The task is to revitalize the historical centre as the world’s cultural heritage of UNESCO (4.4 % of the city area) in harmony with the great number of structural and cultural monuments. In the sense of a sustainable development the conversion projects may help strengthening the city as an important location of living, working and supply also in future.
The industrial belt of St. Petersburg consisting of large brownfields is characterized by its vicinity to the centre, a predominantly good infrastructural connection and a few restrictions in respect of preservation of monuments. For the time being, unclear basic conditions as to the property structure, contaminated sites or official competences complicate the mobilization of these valuable areas equally for the city and investors. However, the political will exists – first of all, with emphasis being laid on the historical centre.

On July 11th, 2002 the administration of St. Petersburg passed an ordinance „On the reformation, reprofiling and moving of the industrial companies settled in the city of St. Petersburg to a different place and rehabilitation of vacant territories“. The ordinance drafted on the suggestion of the committee for economic development of the city has the purpose to develop the historical centre of St. Petersburg further by moving old industrial sites from the historical centre to locations better suited and by making the areas which become vacant available for a new use.

According to the development plan for the city of St. Petersburg about 980 hectares of the area of former industrial sites should be recultivated until 2010, 1,860 hectares until 2015 and 2,840 hectares until 2025. These areas are used commercially or industrially. The huge amount of brownfields in the city, mostly in the attractive vicinity of the city centre and partially with a good connection to an efficient local public passenger traffic allows to foresee the significance which will be attributed to the resource brownfields for the future area development of St. Petersburg. Nowadays the revitalization of brownfields is still completely at the beginning in St. Petersburg. As irrespective of the fact whether these areas are situated in the attractive historical centre or outside the area protected by UNESCO: the existing problems from preservation of monuments up to contaminated sites confront all actors concerned with unusual challenges for the solution of which experience, money and sometimes also the courage are lacking nowadays.

However, the fact that often a new use of brownfields is worthwhile – from an ecological, town planning, functional and economic aspect – is proved by numerous examples from the regions which have been dealing successfully with this topic already for a long time. The Free and Hanseatic City of Hamburg can look back at a long-standing experience in the field of revitalization of brownfields where innovative methods and technologies for the remediation of contaminated sites have played an important role. Hence, the Committee for nature use, environmental protection and ecological safety of the city of St. Petersburg has asked the Free and Hanseatic City of Hamburg to give support in revitalizing brownfields. This was the reason why the joint project REVVIN was established with the Federal Environmental Agency in Dessau as well as the Hamburg engineering office IGB participating as partners. The project is supported by the Federal Ministry of Education and Research and the Senate Office of the Free and Hanseatic City of Hamburg. During its term of two years the following items should be taken into consideration:

- Transfer of the methodical and technological experiences gathered by the administration of Hamburg in the field of the revitalization of brownfields to the administration of St. Petersburg,
- Preparation of the basis and potential actions as an example of a successful revitalization of the brownfields by pilot projects and
- Development of a guideline for actions to reach an integrated revitalization of areas for the city of St. Petersburg with special regard to the problems of contaminated sites.

Pilot project Konjushennaja Square

On the suggestion of the Committee for nature use, environmental protection and ecological safety of St. Petersburg the location of Konjushennaja Square was selected as a pilot project. The complex near the former stables and the stable square Konjushennaja square belonging to it forms an important junction in the historical city centre from an aspect of architecture and cultural history. It is situated

impressively between the world-famous Hermitage Museum, the splendid boulevard Nevskij Prospect and the most significant garden of the city, the Summer Garden. Its typical form is determined by former stables in the north and a closed facade equally needing restoration in the south.

The former royal stables with the Russian-orthodox church above the main entrance to the yard tell an exiting history from three centuries. Its architectural changes from baroque and art nouveau document this impressively. When in 1923 the complex of buildings of the former royal horse administration was handed over to the horse regiment of the militia the fleet of vehicles changed from horses to cars. In the years to follow the complex of buildings was developed into a fleet of vehicles of the Ministry of the Interior with garages and repairshops. In the inner courtyard there was a filling station for internal use. The complex of buildings was given up by the Ministry of the Interior in 2000. Today the private museum of aristocratic culture is in the part of the buildings along the Griboedov Canal. On the square a public filling station was operated between 1932 and 1970, thereupon only its surface installations were pulled down. The square is now used as a car park.

On the northern and eastern sides of the building complex there are the promenades of the river Mojka and Griboedov Canal. Thus, this place is near the way crowded with streams of tourists, yet nevertheless structurally little developed and nearly not used. The main obstacle for a new use is the contamination of soil and groundwater by the filling station. In addition, another danger potential exists by outgassing of easily volatile pollutants: There were the first indications to contamination in 1976 when the buildings were restored. Finally, odour nuisance in the cellar rooms of the eastern part of the building resulted in a restricted use of these rooms in the early ninties.

Altogether there can be stated that the potentials of the location of Konjushennaja Square are at present not used sufficiently which is prevented by the rotten historical building stock and contamination. Here, the possibilities of revitalization seem to be extremely multifarious from the viewpoint of function and urban development. It is a matter of creating good economic, architectural and ecological conditions for a further high-quality development!

Objectives

The area Konjushennaja Square combines a huge number of the tasks to be fulfilled in the historical centre. Thus, in developing this place the following questions are to be put:

1. by which uses this location shall be especially characterized, on the one hand , and, on the other hand, which contribution can be made by to the future profile of use to the functional structure of the historical city

2. how may this place be reintegrated into the city structure by remediation of contaminated sites under ecological conditions

3. which planning of free space and architectural development is appropriate to this place and how shall the historical heritage be generally handled.

The prerequisite to a comprehensive development of the Konjushennaja Square is the remediation of the contamination caused by the former filling station. This must clearly contribute to the ecological improvement of the location integrating thereby its economic possibilities into the development plans including issues of preservation of monuments and urban development in the considerations. The project REVVIN prepared proposals for that from the viewpoint of remediation of contamination which may also have a model character for the conversion of other contaminated locations in St. Petersburg. That is why a remediation investigation was prepared for this location.

Remediation investigation
Field investigations carried out between 2000 and 2004 confirmed the suspicion of contamination in Konjushennaja Square. Their results form the basis for the elaboration of a remedial investigation. After the Russian and German partners researched intensively information on the location of Konjushennaja Square a workshop was held in St. Petersburg in June, 2006 where all information obtained was evaluated and summarised to a model for the site. On basis of this model four remediation variants were worked out which show which temporal (remediation duration) and financial consequences (investment and operating costs) are conncted with the technology applied in each case.

Scenario 1 contains the excavation of the tanks and soil from the main areas of damage where according to the location model the product phase was spread. The area comprises a surface of approx. 3,000 m² reaching up to 5 m below ground level. Because the groundwater reaches approx. 2 m below ground level a groundwater posture is necessary. The groundwater pollution should be eliminated via pump-and-treat. **Scenario 2** envisages the excavation of the tanks and contaminated soil from the immediate surroundings of the tanks. In the further course the light non-aqueous phase liquid has to be removed, the unsaturated soil zone has to be remediated by soil air suction and the contaminated groundwater via pump-and-treat. **In scenario 3** the procedure is analogous to that of scenario 2 a biological in situ treatment of the contaminated soil and groundwater is provided instead of a hydraulic remediation. Deviating from scenario 2 **in scenario 4** a chemical in situ oxidation is envisaged. The scenarios developed provided a decontamination (scenario 1) or partial decontamination (scenarios 2-4). The duration of the remediation varies with the

scenarios between approx. one year and more than 20 years. The suggested variants shall be oriented to the future use of the site. In particular, the variants of a partial decontamination must be seen critical against the background of a limited usability, even if they allow to expect an economically lower expenditure.

Altogether, there has become clear that the question for the costs and duration of the remediation measures has to be discussed in connection with the possibilities of the development of the location: Provided that a sensitive use with residential cultivation is planned, only scenario 1 is considered to be a suitable measure because here a complete decontamination is planned. In the case of a commercial use a partial decontamination can be carried out according to scenarios 3 and 4. Because scenario 2 allows to expect a high residual pollution in soil and groundwater it is classified as being partly suitable. Nevertheless: Regardless of the variant chosen the tanks and the soil in immediate surroundings of the tanks have to be excavated.

The dimension of the restoration of Konjushennaja Square as regards its content is confronted with the challenge to approach these questions in a methodically adequate way. Since here the proper difficulty of revitalization of brownfields is hidden: estimation of the remediation expenditure by the authorities to fulfil various targets of remediation objectives and planning harmonizing thereby ecological / hygienic with the socioeconomic, functional requirements and requirements relating to preservation of monuments and urban development. To be able to consider the problems of remediation of contaminated sites in the planning process essential steps were prepared for a remediation investigation by the example of the Hamburg administrative practice. Knowing the administrative structures of St. Petersburg they were modified accordingly to form part of the overall plan of remedial investigation of Konjushennaja Square.

This plan was enriched with drafts made by students of architecture and town planning from St. Petersburg, Hamburg and Brunswick who designed proposals of use and remodelling. Their solutions show that, on the one hand, the place requires that the historical buildings will be carefully handled, thus allowing only insignificant immediate interventions in the structural substance. On the other hand, the work has shown that the space in the existing buildings and the potential surface in the yard offer, to a great extent, new and multifarious possibilities of use. In different ways the architectural solutions show also that in the midst of the historical city centre space exists for an unusual use. Through a self-conscious architecture and user-friendly free space planning this should give a new glare to the location.

First findings from the working process

The following findings may be preliminarily summarised in the present stage of the project:

Technical innovation!

The remediation of numerous contaminated sites in St. Petersburg will be mastered only with the aid of modern equipment. Fortunately, there can be found out that innovative technologies are increasingly applied by Russian enterprises and the know-how is spread increasingly. Nevertheless, need for discussion exists in view of the assessment of the measuring results and the action steps to be derived from them. From the Hamburg view there has become clear that the pollutant limit values prescribed in Russia are very ambitious because they refer exclusively to an agricultural use. Also knowing the standards of other countries we shall have to consider also within the scope of this project how a further differentiation of the limit values as regards different uses (trade, commerce and living) may look in future in addition to technological innovations.

Comprehensive information!

Development of a location – by the private or public sectors – requires detailed information. Only knowing about the basic conditions of planning allows a comprehensive calculation of a project. This involves the targets of preservation of monument equally as the type and size of contaminated sites. To prevent the inhibitory effect of unclear basic conditions it is worthwhile thinking about the introduction of environmental passports. In this connection the target should be to provide planning security in financial and temporal respect on knowing the remediation costs to be expected in view of the planned uses for all actors concerned. The exchange of information carried out within the scope of this project as well as the systematic, planning-related grouping and processing of the data should be strictly continued.

Technical integration!

According to experience the comprehensive availability of information facilitates the cooperation of the specialised departments because it will be possible to learn from it the different technical interests. In many revitalization projects proof has been furnished that the integrative, interdisciplinary cooperation is essential for a successful development of the project resulting, at the same time, in an acceleration of the implementation of the project. To reuse the huge reserves of areas in St. Petersburg it will be helpful to further strengthen the cooperation which becomes increasingly closer between the individual committees of the city administration.

Open cooperation!

The revitalization of brownfields requires new alliances between different partners. St. Petersburg understood much faster that what developed in cities like Hamburg over a long period. The transformation of the city structures – this, however, does not only refer to the historical city centre – can be mastered only partially by the city itself. That is why the city needs partnerships with investors, operators and users, architects, planners and engineers, associations and initiatives and citizens. An open information policy contributing generally to realistically assessing the possibilities of the area development must be the basis of these partnerships. It is also a prerequisite to making transparent decisions. New forms of the cooperation – as they are also practised within the scope of the REVVIN project by Russian and German partners – as well as innovative methods of the information and participation of the citizens will enrich the wealth of knowledge and experience in each individual case thus certainly promoting a sustainable development of St. Petersburg.

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