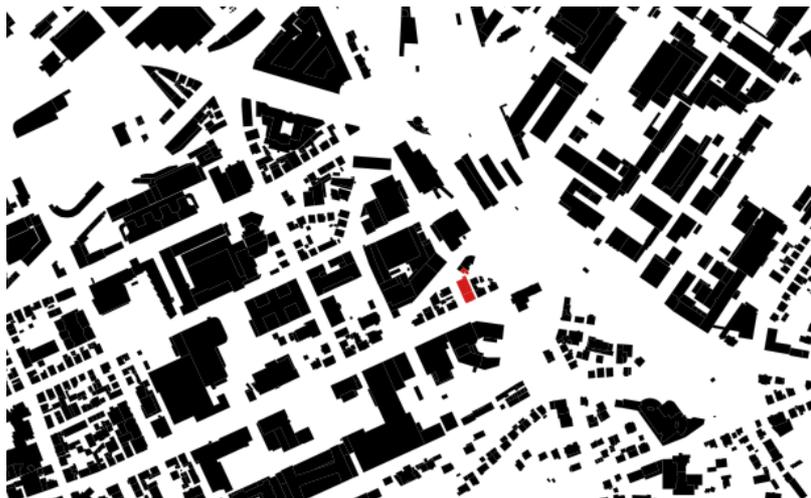




Economic Perspectives of Brownfield Development in Germany

An Integrated Approach - Case Study Stuttgart-Feuerbach



STUTTGART



Imprint

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Number of Pages

140

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November 2012
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Summary

Within the arising interest to sustainable urban development, incremental trend of urbanization rate and increasing demand for exploiting raw materials for energy and fertile land, this research presents an Integrated and Area-oriented Approach for sustainable management of environment and space for the development of contaminated inner-urban Brownfield sites from the perspective of municipalities, with a focus on the economical aspect in the aim of reintegration of these sites into the economic market cycle.

The research work is one of the contributions of CityChlor, a transnational project funded by the EU program INTERREG IV B dealing with environmental protection and sustainable urban development with focus on small inner-urban Brownfields contaminated with CHC.

The incremental trend of urbanization rate and urban areas growth lead to high demand of Greenfield development. To counteract this trend, the German federal government launched a policy for reducing Greenfield development from 100 ha in 2006 to 30 ha by 2020 and to give priority for inner-urban development with a ratio of 3:1. As inner-urban development takes part predominantly on Brownfield sites, number and variety of related issues reach high complexity. Current Brownfield sites within cities were often formerly used for industrial or commercial purposes and are relicts of "Industrialization" and "Economic Miracle" in Germany. Thus Brownfield sites are often heavily contaminated, causing soil, groundwater and indoor air pollution. These contaminations usually are difficult to locate especially contaminations caused by volatile organic compounds (VOC) like chlorinated hydrocarbons (CHC).

In cores of the study a theoretic introduction to economic issues associated with the redevelopment of contaminated Brownfields establishes the basic land marketability criteria necessary for evaluation. A model for categorization of Brownfields, criteria for land valuation, determination of risks associated with the development of contaminated Brownfields and the calculation of Land Market Value are presented. The Brownfield development practice in Stuttgart is illustrated based on available tools, policies, data, funding and the participation in related research projects. The analysis of Brownfield processing figures out respective qualities and bottlenecks. The possibility for an application of the Integrated and Area-oriented Approach on the organizational level is investigated theoretically. A SWOT Analysis to be carried out on a Pilot Site serves as the basis for the categorization of the site with respect to its marketability. The Potential Analysis identifies the possibilities of the site for a successful implementation of the development strategy. The study shows that the theoretical application of the Integrated Approach considering area procedures results in numerous benefits contributing to increase the marketability of the Pilot Site, fundamental for its reintegration into the economic market cycle.

Key Words: Brownfields, contaminated Brownfields, Brownfield development, Brownfield management, remediation, revitalization, reintegration, regulation and administration, economic perspective, economic market cycle, CityChlor, Integrated Approach, Area-oriented Approach

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Acronyms

IA	Integrated Approach
AOA	Area-oriented Approach
S10	Pilot Site “Stuttgarter Straße 10” in Stuttgart – Feuerbach
VOC	Volatile Organic Compounds
CHC	Chlorinated Hydrocarbon
BauGB	National Building Code of Germany
WertV	Land Valuation Act
BBodenSchG	National Soil Protection Act of Germany
LBodSchAG	Federal Soil Protection and Brownfield Act (Baden-Württemberg)
FrAl	Guidelines for the promotion of measures to detect and treat
potentially	contaminated sites and contaminated sites
SVG	Priority areas for urban Development
GRZ	Plot Ratio
GFZ	Floor Space Ratio
BOKS	Soil conservation concept Stuttgart
STEK	Urban Development Concept Stuttgart
NBS	Sustainable Land Management Stuttgart
SIAS	Internal information and geographical information system Stuttgart
ISAS	Municipal information system of contaminated sites Stuttgart
LHS	City of Stuttgart
BMBF	Federal Ministry of Education and Research



I INTRODUCTION

„The main purpose of development should be quality of life for the large majority of people. If you don't have a generous view of cities, then you don't have a generous view of people.“(Lerner, 2011)

The world is going to live in cities. Already now more than 50% of the world population live in cities. The urbanization rates worldwide are growing, especially in developing and emerging countries. Urbanization in more developed regions of the world has already reached 74% (Wyly, 2011). This is also true for Germany. Even though the process of urbanization is much stronger in developing countries, the pressure on cities in developed countries with already high shares of urban population also continues. In Germany, a share of 78% of the population will live in cities by 2030 still increasing to 84% by 2050 (United Nations, 2010).

The increase of the world urban population is determined by natural growth or/and migration (University of Michigan, 2006). However there are differences that should be mentioned. Despite a shrinking population in Germany, cities are growing. In addition to the already mentioned factors above several other reasons have to be taken into account to explain urban growth in Germany: Among others on the one hand the Demographic Change that brings elderly people back to the cities due to existing infrastructure supply, short ways and social contacts, on the other hand the average space demand of German dwellers is increasing and more and more people live in single households.

This situation of expanding cities with high demand for the development of Greenfields is in conflict with the wish and need for sustainable urban development with the attempt to preserve nature. The German ministry of urban development states the current daily need for newly developed land of around 100 ha/day with the effort for a reduction to 30 ha/day by 2020 (BMVBS, 2007, p. 7). Future urban development has therefore to deal with increasing urban population while newly developed land and therefore urban growth in size is limited. Future urban development will take place mainly within the existing city boundaries. Hence Brownfields as a result of urban dynamics are of utmost importance for sustainable urban development.

The topic of Brownfield development is not new but got more and more into the political focus. With the foundation of the neighbourhood association in 1976, Stuttgart and its neighbouring municipalities have been working on policies to mitigate urban sprawl. Starting in 1994 the city of Stuttgart worked out the Land Use Plan 2010, which follows the mission statement “Compact-Urban-Green” and is supposed to be a strong contribution to limit Greenfield development directing growth to inner-urban areas and hence to strengthen Brownfield development (LHS Stuttgart (a), 2004).

This work is part of the project CityChlor, funded by the European Union. It addresses the socio-economic aspects of the development of contaminated inner-urban Brownfields from the perspective of public authorities with focus on economic issues. Numerous research projects deal with the complexity of Brownfield development and its various parameters. The EU project CityChlor specifically focuses on polluted, small inner-urban sites and their challenging boundary conditions. Brownfield development is often difficult especially due to expected or existing contaminations. Challenges for development of a polluted site can be found in the fields of:

- Investigation and Remediation
- Revitalization
- Reintegration
- Regulation and Administration

On all these levels socio-economic aspects are equally important and chosen procedures on one level economically affect the other levels. The economic issue can be seen as a linking bracket. This paper addresses the economic perspective of remediation, revitalization and reintegration of contaminated Brownfield sites contributing to the improvement of administrative Brownfield development processes as integral issues of urban planning procedures.

Integrated approaches require a perfect understanding of the existing situation. Integrated procedures want to simplify processes and on the other hand shall improve the output and increase the benefit for all stakeholders. The integrated way of planning and development is not a new topic in Stuttgart and is already applied for different purposes settled in different departments in Stuttgart:

- Economic Development: Establishment of an “Urban District Manager”
- Office of Urban Planning and Urban Renewal: Establishment of “Neighbourhood Managers” for the Social City Program; Application of “Brownfield Manager” during the research project COBRAMAN.
- They all have in common being settled on a high hierarchical urban planning level bringing together different points of view and enhancing the very important approach of interdisciplinary collaboration. Communication with various actors and stakeholders from different professional fields is a key issue.

The process of planning illustrated in Figure 1 applies the method of Management Control Circuit and displays the importance of communication in the course of project management.

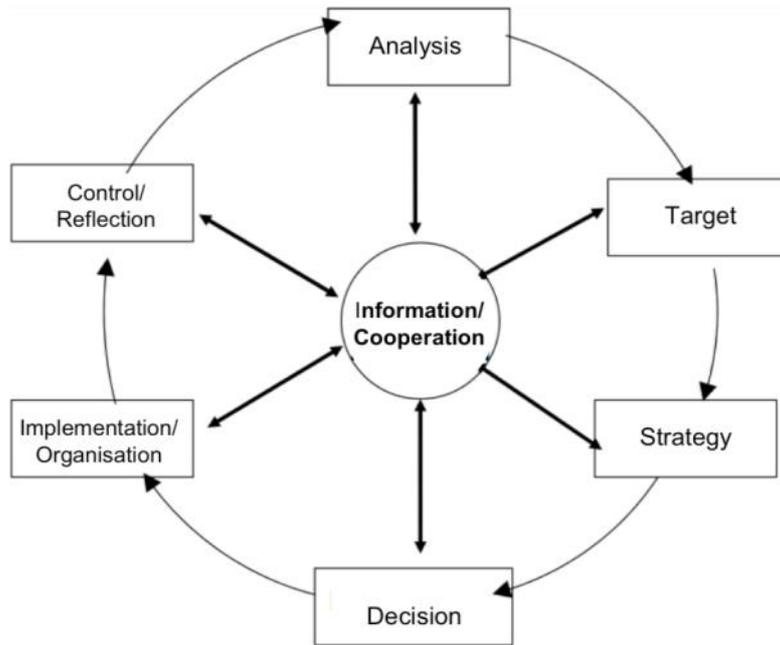


Figure 1: Management Control Circuit, Source: (Innovative Dienste Köln, 2006), Translation by the author

1 Project CityChlor

The EU Project CityChlor is a transnational cooperation project with the "overarching goal of developing an integrated approach to improve the soil and ground water quality and the minimization of pollution caused by volatile chlorinated hydrocarbons (CHC) in urban areas. [...] The project will focus not only on expertise of investigation and remediation of CHC damage, but also develop integrated processes that include public participation, organizational and socio-economic aspects. Dealing with risks of contamination and their removal is facilitated, leading to a more sustainable land use and thus leads to an improvement of the environment and quality of life "(City Chlor, 2009, p. 4). The complementary project team consists of partners from Flanders, France, Netherlands and Germany.

1.1 Scope

Chlorinated solvents are very common contaminants of soil and groundwater as they were usually used as solvents and degreasing agents. The physicochemical properties of CHC can lead to large-plumes of pollution in the groundwater. Respective substances were often used by small-scale activities as dry-cleaners, garages and printers that do not have financial resources to solve the problem. Mostly situated in cities within densely populated areas, remediation of this type of pollution is a slow, difficult and complex process. Polluters very often cannot be traced or held liable due to the mixing of pollution from different sources (City Chlor (a), 2011).

The main challenges for the city and its population resulting from pollution with chlorinated solvents are formulated in (City Chlor (a), 2011) as:

- Direct risks by exposure to contaminants (indoor air and groundwater quality);
- The indirect restraining of redevelopment of areas;
- The harming of the quality of life due to the slow processes of investigation and remediation and the resulting long period of uncertainty.

Beside the effects on the environment, these pollutions also have a socio-economic impact for the parties involved and their environment. Extensive research is already done to possible technical solutions, but the urban environment as a complex system requires a more specific approach. As a result CityChlor applies an integrated approach for this type of pollution.

Thereby "CityChlor will not only bring together technical knowledge, but will elaborate directives on how should be coped with organizational and socio-economic aspects and community involvement. This has to lead to a more efficient and faster tackling of this often occurring type of pollution."(City Chlor (a), 2011)

Objectives and Implementation

"The project aims at contributing to the minimisation of soil and groundwater pollution by tackling urban soil and groundwater contamination caused by chlorinated solvents.

Main objective is to develop an "integrated approach for contaminated site management". This is meant to be a holistic risk management approach for chlorinated solvents in an urban environment, facilitating Brownfield

redevelopment and matching the needs of sustainable urban development. It comprises aspects of environmental technology, risk assessment and communication, urban planning and economic aspects. It will facilitate a paradigm shift from traditional “single-case treatment” to the consideration of larger areas, thus integrating in spatial dimension and in transdisciplinary sense. This will contribute to the further development and increasing effectiveness of national action plans and funding programmes for the abatement of groundwater pollution and contaminated sites.”(City Chlor (a), 2011)

1.2 Project Organisation

The research project is partitioned and more specific work packages are dedicated to the following objectives: Review and Integration, Characterization, Remediation and Socio-Economic Aspects. Each work package comprises several action points.

Review and Integration (Work Package 1):

Review and Integration aims at delivering the central output of CityChlor, the “Integrated Approach for Contaminated Sites Management” (City Chlor (c), 2011).

Characterization (Work Package 2):

Work Package 2 supports the Water Framework Directive and Groundwater Directive (WFD/GWD): Including testing, verification and development of best practises for monitoring and characterization technologies to meet the requirements set by the “prevent and limit” objective for industrial pollution at local and regional level (City Chlor (c), 2011).

Remediation (Work Packages 3):

Work Package 3 focuses on techniques for remediation of chlorinated solvent pollution. Actions will consider the dual approach to source and plume in the urban environment. Barriers for market acceptance of innovative in-situ remediation technologies shall be removed by applying demonstration and validation sites for innovative technologies based on pilot projects in partner cities (City Chlor (c), 2011).

Socio-economic aspects (Work Packages 4):

Dealing with Socio-economic aspects aims at creating a social, financial and economical solid base for policymakers, cities, professional experts and other stakeholders to implement the new integrated approach in North-western Europe. It tackles the social and economical aspects that are related to soil and groundwater remediation. (City Chlor (a), 2011); (City Chlor (c), 2011)



Figure 2; Work packages CityChlor; Source: (City Chlor (c), 2011), (von Schnakenburg, Peter (a), 2010), Author



“CityChlor paves the way for the remediation of large urban areas instead of the case-by-case remediation, by embedding the area-oriented approach in the framework of urban renewal and redevelopment activities. This approach will lead to strategies for a more sustainable land use in urban areas.” (City Chlor (d), 2011)
Accordingly projects main objectives with focus on economic issues are:

- Significant reduction of remediation costs: Alternative financing concepts, cost-benefit potentials of the area-oriented approach and innovative technologies will lead to a reduction of costs for the society.
- Facilitation of urban development and the redevelopment of contaminated Brownfield sites:
Establishment of routine procedures to manage pollution related risks in urban development. Creation of tools for community involvement to increase the correct perception of risks related to pollution. Both will enhance to redevelopment of polluted sites.

2 Research Background

Contaminated sites are the flip side of the enormous technical and industrial progress of the last 100 years. The all too careless handling of chemicals and waste and the ignorance of its effects often led to contamination of the subsurface. The potential risk for humans and the environment has often been detected too late. The state of Baden-Wuerttemberg has begun to work on the problem of contaminated sites systematically already in 1988. Later in 2002 the first nationwide coverage of suspected areas was completed. The workup of these legacies of the industrial history is very costly. Since 1988 the country has spent around 600 million euro of funding for the local treatment of contaminated sites. Considering the expenses of communities and the compulsory private investments for remediation, so far a multiple of that number was used for remediation of the contaminated sites in Baden-Wuerttemberg. It is assumed that 10 to 20 years are required for the refurbishment of remaining contaminated sites and a total cost of about another 1 to 2 billion Euros is estimated. The redevelopment of inner city Brownfield sites is in many cases, a crucial prerequisite for future economic and urban development. The associated reduction of land consumption is one of the main environmental objectives of the federal government. Wherever possible, revitalization of Brownfields is given priority over the use of undeveloped land on Greenfield sites (LUBW, 2006, p. 3).

The State of Baden-Württemberg aims to have all the contaminated sites cleaned up till 2030. From the estimated 1.5 billion Euros needed for the remediation 30% refers to the remediation of municipal sites. With the money available for remediation it will take around 60 years to reach the stated goal (Lehmann, 2008). So additional strategies for the financing, especially of contaminated Brownfield projects have to be investigated.

In the frame of climate change, the preservation of natural resources, inner-urban development and as a result the rehabilitation, revitalization and reintegration of underused, partly underused and abandoned former industrially and commercially used sites became more and more important. These sites known as Brownfields are often located within the urban fabric. Existing or suspected contaminations of Brownfields imply great risks for investors and therefore hamper the urban redevelopment process with severe impacts on all levels: the social (not attractive sites), the environmental (contamination remains and causes risk to nature) and economic (negative effects on land value of surrounding sites, loss of values due to missing investments). The main obstacles for inner-urban development can therefore be identified with existing contamination and related risks concerning costs for investigation and remediation and consequently marketability.

The economic aspects are dealt with in work packages four (WP4) of CityChlor. Even though being the last research topic in the list, the economic issue is quite contrary to a more accompanying topic, linking the other actions and even does not stop with the successful clean up but also considers the reintegration of the site into the market cycle.

“One of the key drivers of Brownfield regeneration is the economic revitalization of an urban area and the potential profit to be made.” (CABERNET, 2006, p. 54)

Accordingly this study accompanies the process of Brownfield development from the economic perspective. It is a core topic in the field of inner-urban development especially related to the development of contaminated Brownfields.

Beside the mitigation of newly sealed surfaces, the development of Brownfields has advantages and disadvantages in comparison to Greenfield development. The main advantages are centrality/proximity and

supply with existing infrastructure. Disadvantages are existing contaminations due to former industrial uses, high development complexity often due to problematic ownership and the great number of stakeholders due to the great number of affected people in inner-urban situations as well as the question of financing of loaded sites. Further on, different interests have to be distinguished: While contaminations reduce property value what is not in the interest of owners and possible developers, sites with existing poisonous waste risk contaminating groundwater which is not in the interest of the public. Remediation is therefore in the interest of both, private and public stakeholder.

2.1 Problem Statement

Climate change, demographic development, increasing urbanization and an increasing demand of living space urgently require sustainable handling of spatial resources in planning considering ecological, social and economical aspects.

Most of the inner-urban sites that can be used for development are Brownfields. These Brownfields are often loaded due to former industrial uses. Hundreds of contaminated sites, often located in central places due to historical urban development processes therefore have to be cleaned up to avoid pollution of groundwater. Bureaucracy and often not transparent administrative structures, high rates of return required by private developers, high complexity due to the participation of a great number of stakeholders crashes with the urban needs for development.

According to (LUBW , 2009) Stuttgart has the highest concentration of contaminated and suspected sites in Baden-Württemberg. This is due to industrialization and development processes during the past two centuries. The city of Stuttgart is limited to growth due to its geomorphologic setting, but growth takes place. Moreover dealing with the economic perspective of Brownfield development so many aspects (e.g. different spatial levels) have to be considered. Accordingly different levels must be distinguished, the urban level and the project level.

In contrast to areas with former industrial or military uses with usually large areas and therefore despite of contaminations capturing the interest of developers the Brownfield sites to deal with in this research work are mostly small sites of former small craft enterprises and problematic to be developed. In spite of well located within the city those areas are not of interest due to existing contaminations, high development risks and little revenue, which is often a no go for investors. As the causer often is not available anymore and the owner does not have sufficient financial strength, the public takes over the financial burden to remediate the site. But financial resources of municipalities available for remediation are also limited.

2.2 Objectives

Sustainable Urban Planning and Development demands comprehensive approaches. This is especially true for the development of Brownfield sites polluted with volatile chlorinated solvents (VOC), which cause severe and contamination affecting soil, air and groundwater. These are the boundary conditions CityChlor copes with. Reflecting the holistic idea of the project the goal related to the test site in Stuttgart aims at "Finding a good solution for site and space" (von Schnakenburg, Peter (a), 2010).

The objective of this study is to examine the influence of administrative and planning procedures on Brownfield remediation and development from an economic perspective as well as understanding of needs to promote private initiatives especially for the development of small, contaminated sites.

The results of this paper should provide practical tools and procedures that can be applied in everyday life planning. The complex situation hindering and discouraging investors shall be understood and counteracted with comprehensive practicable planning and management procedures. The fact of high financial needs for remediation shall also be considered in order to supply cleaned up sites in an adequate time span and consider the risk for human health and environment.

The main objective is to investigate and analyse the economic aspects of future oriented development of contaminated Brownfield sites comprising remediation, revitalization, reintegration of rehabilitated sites and regulatory and institutional issues. It copes with the importance of economic viability of these sites, the key issue for decision-making and implementation and therefore inner-urban development with focus on sustainable reintegration of rehabilitated small and former CHC contaminated sites into the economic market cycle. Taking into account that all objectives should be focused on the stated policies and on the measures proposed by CityChlor.

Accordingly a set of specific objectives has been identified:

- Identifying policies addressing the economic key issues of the development of contaminated Brownfields.
- Identifying stages of sustainable Brownfield development.
- Understanding of existing planning and rehabilitation procedure in Stuttgart, its strengths and bottlenecks.
- Applying the Integrated Approach and Area-oriented Approach at different development phases at urban and project level to prove attainable benefits for the reintegration of contaminated Brownfields.

Sustainable reintegration of rehabilitated sites into the economic market cycle considers remediation achieving preconditions for any land use, revitalization achieving adequate uses, densities and integration of sustainable urban concepts as well as regulatory and institutional issues achieving integrated and streamlined coordination processes comprising organisation and communication embedded in a legal framework in order to increase the market value, to reduce reclamation costs and risks.

2.3 Research Conceptual Overview

Driving from the core objectives of the study that to investigate and analyse the economic aspects of development of Brownfield sites comprising remediation, revitalization and reintegration of rehabilitated sites, a conceptual integration for objectives, policies and measures to be adopted was developed, Table 1. The measures of Integrated and Area-oriented Approach are proposed by the project CityChlor. As reflecting a holistic approach they are applied on both, the urban and project level.

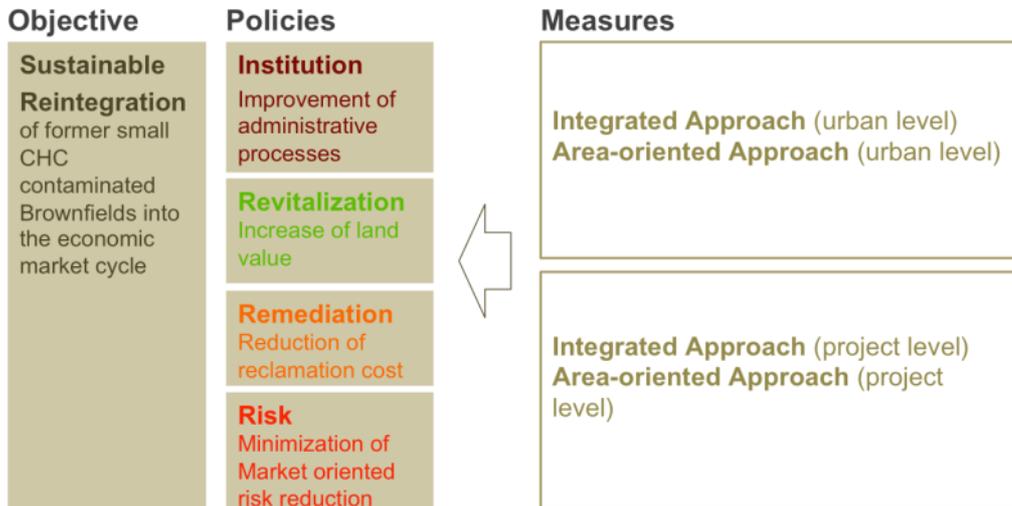


Table 1: Objectives, Policies and Measures; Source: Author

Planning processes have to be effective as a prerequisite to shift Greenfield development towards inner-urban development. The need for inner-urban development and the need for remediation of contaminated urban sites shall be brought together in order to improve efficiency of planning and management processes as well as financing of Brownfield development.

Often used single and site-specific approaches and incidentally chosen sites for remediation shall be shifted to area-specific approaches where the decision for remediation of contaminated Brownfield sites follows an overall planning concept. Therefore the study on the urban level deals with policies, planning and administration and on the project level the site related aspects on the micro level are considered. Social costs for remediation shall be reduced. The involvement of the private sector can be a strategy to achieve this issue. However economic requirements of the private sector have to be considered. It shall be shown that the application of the Integrated Approach and Area-oriented Approach can lead to reduction of social costs on the one hand and can lead to future oriented development for the city on the other hand.

This paper will deal with this demanding situation mentioned above mainly looking on the question from the public and administrative perspective trying to answer three main questions on basis of a case study project “Stuttgarter Straße 10” in Stuttgart - Feuerbach:

- How the need for inner-urban development can help to clear and clean contaminated Brownfield sites in order to transfer these sites to the property market?
- How the need for remediation of contaminated sites can influence the procedure of Urban Planning and Urban Development?
- How economical burdens of Brownfield development due to the need of remediation of poisonous waste can be minimized and transferred from the public to the private market?

Using Investors to develop urban sites became more and more popular in the last decade. It was on the zenith after the reunification when huge shopping malls were developed on Greenfield sites at the fringes of the cities. This had not just tremendous impacts on the ecology and the natural environment but also on the cities as highly interrelated creatures. Recognizing these problems it was understood that more serious legal

and political boundary conditions and sustainable planning objectives had to be installed. It just has to be considered that for investors an investment is just reasonable by getting back the right rate of return. Otherwise the investment would be a loss from the perspective of the investor. The development of inner-urban sites normally is far more complex than the development on Greenfields even though in the first case infrastructure is already in place while in the second case everything has to be developed from the scratch. Therefore the public administration carefully has to consider these aspects to increase the social benefit as much as possible using investors for development. The contribution from the public has to be the consideration of the investors' interests. This requires the establishment of a transparent planning environment in which the public guides the process representing society and not being guided by the financial interests of the developers due to lacking money and needs for development. Creating awareness of the situation requires knowledge about the problems, needs, strength weaknesses but also opportunities and threats of projects.

In addition to co-financing of remediation the public can support the need for Brownfield remediation with an efficient planning and administrative process on the urban level. The application of the idea of an Area-oriented Approach instead of just site-specific procedures will be shown for the field of city planning on the urban as well as on the project level.

2.4 Structure of the Paper

This paper is structured in four main parts.

The First Part (chapter 1-2) introduces the research project CityChlor and its objectives as the contextual frame for this study. The focus of research and the topic this work copes with is defined and presented. The Second Part (chapter 3-6) deals with the theory and practice of Brownfield development. Basic terms are specified (Chapter 3). Chapter 4 introduces some background information on the history of Brownfields. Chapter 5 presents the theoretical approach for a basic understanding of existing interrelations between economic aspects, contamination, remediation and revitalization. Chapter 6 with focus on the city of Stuttgart investigates existing policies, available data, attended research and pilot projects as well as funding programs in the context of Brownfield development in the city of Stuttgart. It also explores and analyses the existing practices of Stuttgart from the perspective of public authorities. Perceptions are outlined in an intermediate summary. The Third Part (chapter 7-9) deals with the case study of CityChlor. It presents the application of newly introduced measures of the project CityChlor. Chapter 7 introduces the proposed measures of CityChlor and their theoretical application in the case of Stuttgart. Chapter 8 presents the case study area and the Pilot Site. Chapter 9 identifies the potentials for development of the Pilot Site and the benefits attained applying the proposed measures of CityChlor. Finally the Fourth Part (chapter 10-11) concludes with a final summary of investigated and observed aspects influencing the process of Brownfield development from an economic perspective (chapter 10). In chapter 11 conclusions are drawn and recommendations are stated as a result of the research done.

2.5 Methodology

This thesis comprises of four different parts. According to the content, the stage of processing and necessity to achieve reasonable outputs miscellaneous methodologies are applied respectively Figure 3.

The First Part as an introductory part rules as a guiding frame for the whole work. In this part the research issue and the main objective is presented. Policies, specifying the objective narrow the desired output down. Measures presented finally give an insight of how the objectives shall be achieved. This set is also prerequisite for the final evaluation of the obtained output. The Second Part comprises detailed literature research and data analysis on existing studies about economic aspects, financing, policies, management and processes in the field of urban planning and Brownfield development. Expert interviews with representatives of different authorities, which are responsible for planning in the city of Stuttgart, complete the research. For the purpose of analysis current practice in Stuttgart regarding the development of polluted Brownfield sites is categorized. Part Three introduces proposed measures by CityChlor and demonstrates their possible applications on different planning levels. A SWOT Analysis on a macro and micro level of the Pilot Site as part of a Vendors Due Dilligence shall provide an understanding of strength and weaknesses as well as opportunities and threats. A Potential Analysis then investigates the current development potentials of the Pilot Site. Scenario Planning as the final step demonstrates the distinct options for development considering existing framework conditions like the planning law. According to the initially set policies the scenarios are evaluated. The final Part Four summarizes results attained, draws conclusions from the evaluation and formulates recommendations to improvement of existing tools and practices in the city of Stuttgart.

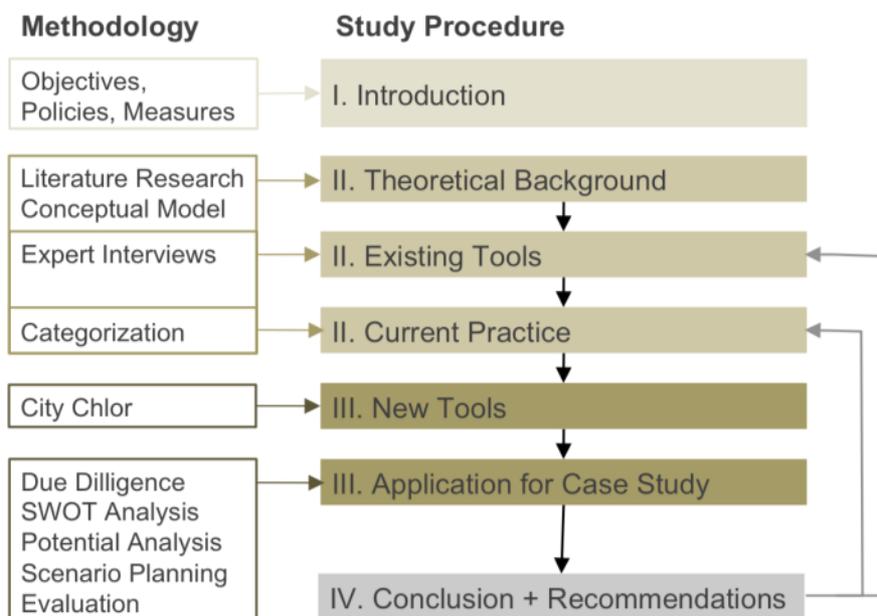


Figure 3; Study procedure and applied methodologies; Source: Author

II THEORY AND PRACTICE OF BROWNFIELD DEVELOPMENT

“Urban development was always very creative and successful when dealing with natural and self-imposed limits.” Prof Bernd Scholl (LHS Stuttgart (a), 2003, p. 4)

Brownfields are part of urban transformation processes and products of change. Changes, which can be structural changes, economic changes, demographic changes and also cultural changes. Cities can be described as urban organisms using land as natural resources, which underlie a dynamic transformation process. The status of Brownfields is part of this process. Two main types of Brownfields can be distinguished: contaminated or suspected contaminated Brownfields and not contaminated Brownfields. Contaminated sites often face the difficulty that their potentials are often estimated as too low to be brought back into the market cycle without additional input due to environmental and associated uncountable economic risks.

Land is valuable and a scarce resource. Therefore the economic perspective on contaminated Brownfields can help to understand influencing factors for successful and sustainable reintegration of these sites into the market cycle.

This part of the study gives an insight into necessary background information of contaminated Brownfields with regard to their historical origins and changing status over time. It is both, a theoretical approximation from an economic perspective and a practical demonstration of how the city of Stuttgart deals with the challenge of existing contaminated sites.

3 Understanding of Basic Terms

3.1 Brownfield Development

Talking about Brownfield can be tricky. It highly depends on the perspective of the speaker of what is implied with the expression. An urban planner might consider a Brownfield as an abandoned former industrial site, which has bad impacts on the surrounding urban fabric. From the perspective of environmental engineers Brownfield most likely are contaminated sites, which might have serious impacts on the environment and are of risk for human health. For businessmen a Brownfield might be an adequate and cheap place for commercial activities, for architects it might be an opportunity to develop unconventional architectural ideas. For kids it might be just a forbidden place for adventures. There are certainly a lot of other perspectives. The same is true for understanding and definition at European level. No standard definition for Brownfields can be found across Europe. „However, in common usage the term refers to previously developed land, encompassing a range of sites in terms of size and location“ (CABERNET, 2006, p. 23). In Table 2 different definitions of ‘Brownfield’ according to the countries of the four main contributors of CityChlor are represented.

Country	‘Brownfield’ Definition	Source
Flanders	Abandoned or under used industrial sites with an active potential for redevelopment or expansion but where redevelopment or expansion is complicated by a real or perceived environmental contamination (legislation including a definition is in the process of approval).	Openbare Afvalstoffenmaatschappij voor het Vlaamse Gewest (OVAM)
France	Space previously developed that are temporarily or definitely abandoned following the cessation of activity and need to be reclaimed for future use. Can be partially occupied, derelict or contaminated.	Ministere de l’Environnement
Netherlands	No commonly recognised definition	
Germany	Inner city buildings not under use. Inner city areas for redevelopment and refurbishment	Umweltbundesamt Berlin

Table 2; Definition of ‘Brownfield’ in CityChlor partner countries; Source: (Lee & al, 2005; CABERNET, 2006, pp. 29-30)

3.1.1 Brownfield

According to CABERNET Brownfields are defined as sites that: “have been affected by the former uses of the site and surrounding land - are derelict or underused – may have real or perceived contamination problems - are mainly in developed urban areas - require intervention to bring them back to beneficial use” (CABERNET, 2006, p. 23).

This definition is appropriate for this study because it considers not just the environmental conditions of soils but in addition the structural status of Brownfields and its effect on the urban environment.

3.1.2 Brownfield Development

Brownfield development in the context of this study comprises, remediation, revitalization and reintegration as a display of sustainability issues, which respectively are environmental issues, social issues and economic issues.

Remediation (environmental issue):	Cleaning up contaminations
Revitalization (social issue):	Elaborating land use concept as part of an overall urban planning concept with the idea to integrate the site from the planning perspective into the urban fabric
Reintegration (economic issue):	Successful commercialization and utilization on the market

Table 3; Phases of sustainable Brownfield development; Source: Author

3.2 Integrated and Area-oriented Approach

See section 7.2

3.3 Volatile Organic Compounds (VOC)

“A chlorinated solvent is an organic compound containing at least one covalently bonded chlorine atom. Their wide structural variety and divergent chemical properties lead to a broad range of applications. Many derivatives are controversial because of the effects of these compounds on the environment. Chlorinated solvents are amongst the most common soil and groundwater contaminants due to their widespread use as solvents and degreasing agents. Because of their physicochemical properties, they produce large-plumes of pollution in the groundwater” (City Chlor (e), 2011).

4 History of Brownfields

Brownfields can have serious effects on their urban environment. That is not just true for contaminated sites affecting men and nature. Often long-term stand by times have negative economic and social impacts on cities. In addition prosperous and well-developed cities like Stuttgart are lacking urban areas for both, housing and industry and commerce. Abandoned sites affect the social environment and influence the perspective of neighbourhoods or even districts. Brownfields therefore play a dual role in the organism of a city. On the one hand they negatively affect on the other hand they are valuable resources for urban development and economic growth. It cannot be denied that Brownfield development and urban development in the sense of urban “well-being” are closely linked.

Dealing with the issue of contaminated sites inevitably requires addressing the question of how existing Brownfields arose and when they were generated. This requires a flashback into the history at the time of Industrialization in Germany.

Industrialization in the 19th and upcoming 20th century led to the mixture of traditional urban structures and large production sites. Industries developed in the vicinity of residential areas. The production sites were built

without consideration of emissions and lack of space inside the existing cities starting at adequate places near rivers or already existing small companies that were extended due to increasing production. The driving force of Industrialization has been the invention of the steam engine and the conveyor belt. The large amount of workers needed for the growing industries lead to an enormous increase in population and therefore to an extension of cities. The cities grew around the industries and production sites. At the same time when Industrialization took place the locomotive was developed and trains were used to support the industrialization process by caring large amounts of heavy goods for production processes. As the production sites were placed in the cities, tracks and train stations were constructed up to the city centres connecting production sites, cities and dismantling areas. This was also one reason why German cities were destroyed to a high degree during world war 2nd.

In the decades after world war 2nd reconstruction of demolished and partly demolished houses was not sufficient. Therefore new developments of mass housing took place at the fringes of the cities.

An additional aspect refers to military barracks. Even though located at the cities` borders, the growing urban fabric incorporated these settlements. Like industrial production sites they can be found at different places all around the urban extension.

Later in the 20th century, when the tertiary sector developed, offices were added and started to replace the industrial, often contaminated sites. "Brownfield sites differ in size, former use, and location. A "first generation" of Brownfields appeared in Europe with the closure of large sites in the 1970s. The generation of Brownfield land is a normal phenomenon as a consequence of land use change" (CABERNET, 2006, p. 25). But industries are still found in core areas of developed cities.

As a result of military downsizing and the vacation of transport infrastructure at the beginning of the 1990s these sites have been added to the list of Brownfield sites. "That is not to say that during this period there has been an accelerated cycle of site reconstruction and redevelopment in a number of urban areas"(CABERNET, 2006, p. 25).

This development rules for most of the major cities in Germany. As especially development took place in the region of Stuttgart and as today was one of the most important industrial locations in Germany the city has still to deal with these impacts.

According to the different causer the "scale of individual Brownfields can differ from extremely small sites in mixed urban areas up to large military sites, such as former industrial sites or military airfields." The scale of Brownfields has become a rising problem since the European economic crisis in the 1970s. The restructuring of smaller sites within the urban fabric became more prominent in the 1980s (CABERNET, 2006, p. 25).

5 The Dimensions of Brownfields

The reduction of newly utilized land is a focal point of the German governments National Strategy for Sustainable Development. The currently used land of about 100 ha per day shall be lowered to 30 ha a day by 2020. At the same time it aims to achieve three times as much internal development than external development. Strategic management is required to ensure the stated quantity and quality (difu, 2008, p. 2).

5.1 Circular Land Use Management

Land is a valuable resource. Similarly to the recycling-based policy applied in areas such as waste and water management the idea of Circular Land Use Management follows the philosophy, which can be expressed with “avoid – recycle – compensate”. Existing material cycles can be understood as models (difu, 2008, p. 4). Circular land use management firstly aims at investigation of the potentials of existing structures and secondly on the reuse of derelict land in order to diminish development on “green-belt” land. It deals with the activation of existing building land, including among others, gaps between buildings, Brownfields and the investigation of infill capacities shown in Table 4. According to the principle of (re)use, “[...] the constructed city is understood as a system with a structural makeup which is subject to various usage phases and where, in certain instances, entire districts and industrial areas are dismantled and made suitable for subsequent use, whereby the total area of land used should remain unchanged.” (difu, 2008, p. 4). Recycling measures of land after use can be renaturation, infill and (re)development.

The different phases of land use comprising allocation of building land, development, use, abandonment and reuse are presented in Figure 4.

Expansion opportunities (outlying land which has yet to be developed)	Theoretical development reserves with no (specific) planning status Regional planning reserves (anticipated building land) ¹ Preparatory land use plan reserves (building land awaiting development) Legally binding land use plan reserves which are fundamentally reclaimable (raw building land)
Internal development opportunities	Gaps between buildings (land prepared for building/building land) within the ambit of settlement-expanding legally binding land use plans Gaps between buildings within the ambit of legally binding land use plans using pre-existing developments and unplanned interior areas. Scarcely developed lots/opportunities for infill Brownfields Vacant buildings Land which will be abandoned in the foreseeable future

Table 4; Expansion and internal development opportunities of land; Source: (difu, 2008, p. 4)

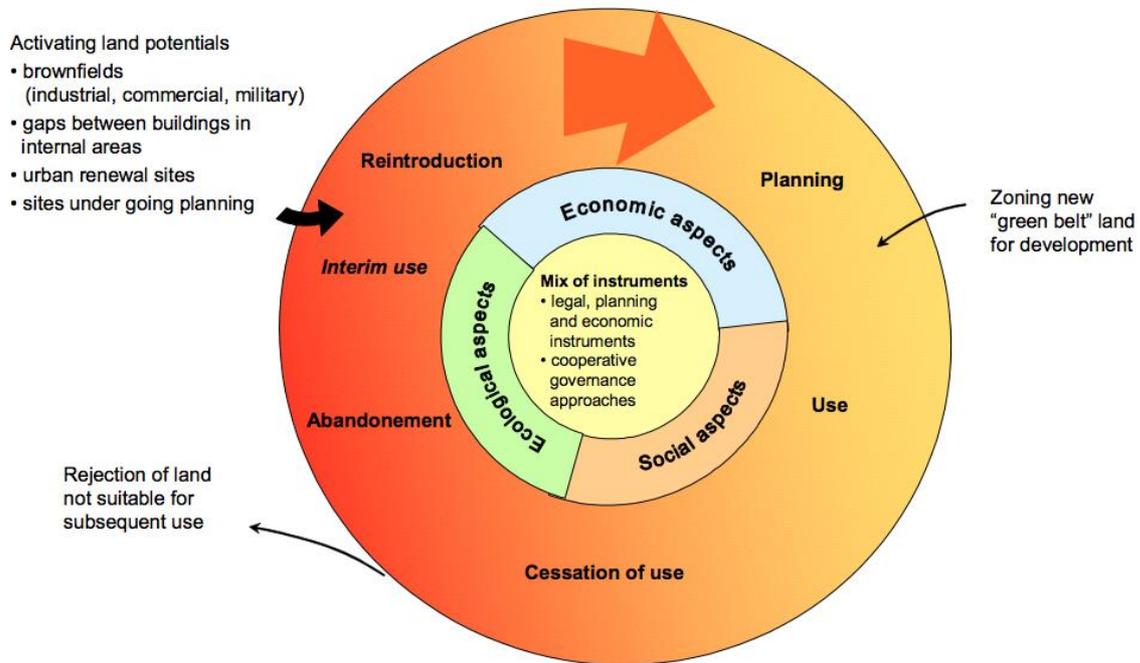


Figure 4; Phases and potentialities of circular land use management; Source: (difu, 2008, p. 4)

5.2 Sustainable Brownfield Development

“Sustainable Brownfield Regeneration is the management, rehabilitation and return to beneficial use of Brownfields in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations in environmentally sensitive, economically viable, institutionally robust and socially acceptable ways within the particular regional context” (CABERNET, 2006, p. 53).

5.2.1 Brownfield Development

Brownfield development is a substantial part of the circular land use cycle management and can also be described as a management process. The process of Brownfield development is complex due to often very uncertain environmental conditions, the great variety and number of stakeholders and therefore economic risk. The development of Brownfield sites is a common component of environmental remediation, land use planning and economic policy. Especially urban Brownfields are a challenging issue for local stakeholders in terms of: “Remediation of the environment, Revitalization of former industrial sites in the urban and regional context, Reintegration of rehabilitated sites into the economic cycle” (CLARINET, 2002, p. 4).

Former discussions about the management of Brownfield sites often were reduced to the aspect of environmental remediation. Of course the key issue of Brownfield management is the elimination of environmental risks with respect to the use of the site. Risk management not necessarily requires further actions in the sense of revitalization of the site and its reintegration into the economic cycle. Contaminated sites that endanger the environment are considered as environmental problems. Abandoned sites may be considered spatial planning problems with inherent economic and social impacts. The issue of Brownfield development is therefore an issue of sustainable development comprising the dimensions of sustainability:

economic issues, social issues and environmental issues. “As a result the major trend in policy development is to address environmental issues and spatial planning issues simultaneously. Efforts to develop such integrated approaches have also resulted in a shift in attention of policy makers from the assessment of problems to the formulation of solutions that will meet the needs of society in a sustainable way” (CLARINET, 2002, p. 4). According to (CABERNET, 2006, p. 53) a fourth dimension of sustainability, considering regulatory and institutional issues, is introduced. Translated into actions the mentioned four dimensions of sustainability can be presented as shown in Figure 5.

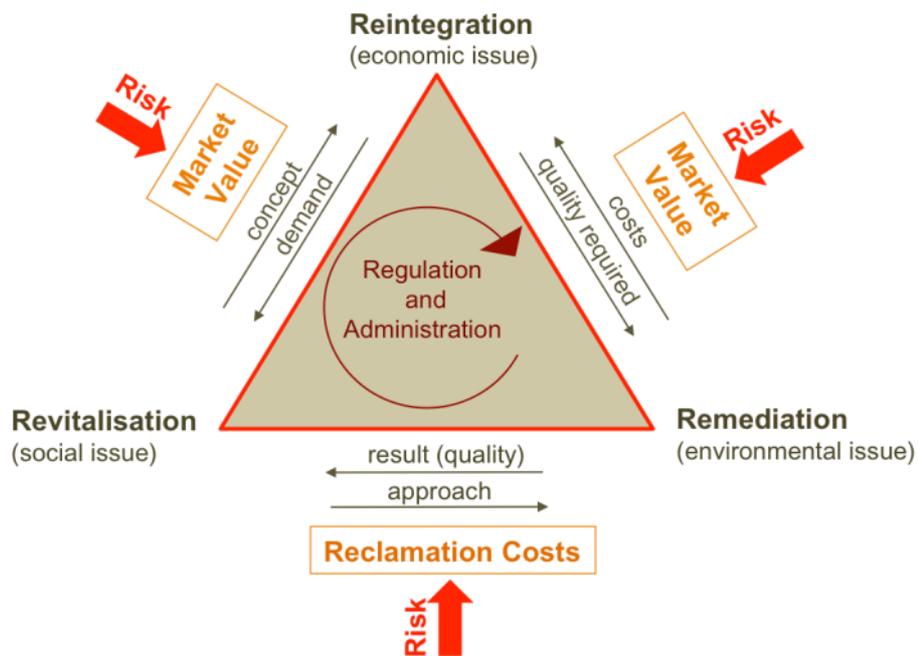


Figure 5; Actions of sustainable Brownfield development; Source: Author

5.2.2 Municipal Brownfield Management

Sustainable Brownfield development requires a comprehensive Brownfield management bringing together the different aspects of sustainable development. A prerequisite for comprehensive planning and Brownfield management is the availability of sufficient information and data about the current situation as well as of predicted future situation. Decisions need to be based on up-to-date detailed information. Acquisition of data is not easy and due to its amount neither easy to store nor to handle. In addition legal aspects for the administration and application of data are of utmost importance. Authorities therefore play an important role especially at the municipal level.

Municipalities are responsible for the achievement of future oriented, desirable and competitive urban environments. It highly depends on their actions and policies how and to which extend Brownfields are brought back into use or stay derelict. Strategic approaches for Brownfield development are therefore urgently needed on the local governmental level. Urban planning and development strategies are linked to strategies for Brownfields. Municipalities are therefore requested at least partly to be involved in Brownfield development (CABERNET, 2006, p. 77). Decisions for public actions and interventions always have to be

transparent and justifiable. This is just possible if investments contribute to a wider benefit than just to improve the position of certain properties. Policy objectives and priorities have to guide public initiatives not just on a case-by-case basis but also as an overall development strategy(CABERNET, 2006, p. 84).

Approaches to Brownfield development can differ within the government and different planning levels of authorities. The complexity of Brownfield development and changing procedures demanded to cope with the specialties of Brownfield sites require more flexible planning systems “for example in terms of redevelopment time, technical restrictions, changing market conditions, etc”(CABERNET, 2006, p. 81).

The methodology of municipal Brownfield management can be summarized as shown in Figure 6 and comprises three main work steps, which are: Inventory Data Acquisition and Data-visualization, Land Appraisal and Evaluation.

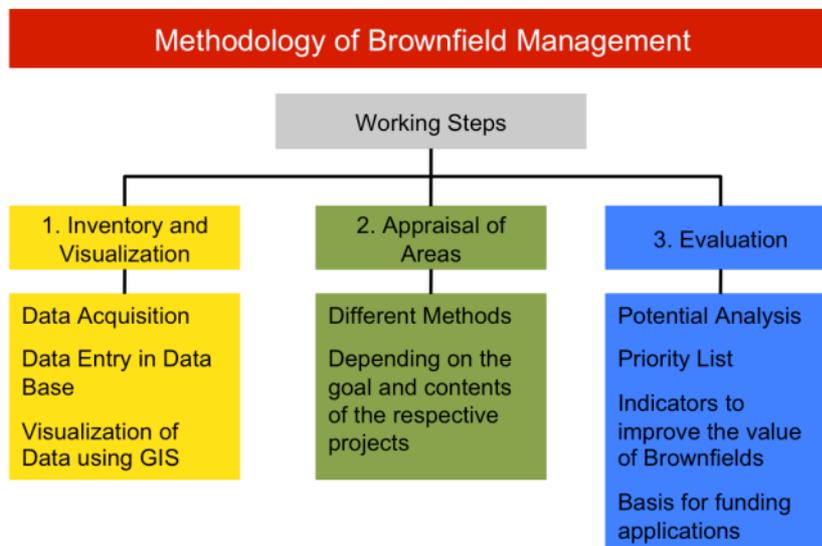


Figure 6; Methodology of Brownfield Management; Source:(Saxonia, 2011), Translation by the author

5.2.3 Stakeholders in the Process of Brownfield Development

It is claimed that Brownfield development is complex. The multi-disciplinary level and the need for integration are usually very high. Large expected risks due to e.g. contaminations might lead to high and unexpected development costs. Complicated planning processes, which make scheduling impossible and output of planning are often criticized by developers (CABERNET, 2006, p. 81). In order to enhance the process of Brownfield development the process itself has to be understood and important actors have to be determined. There are two main stakeholder groups that can be distinguished. On the one hand the board of regulatory and institutional actors, which are represented by politicians and public authorities on the other hand private stakeholders, which are represented by users, investors, owners and public interest groups.

The cooperation on a vertical level (authorities – private stakeholder) and on a horizontal level, which can be either among public institutions or among private stakeholder groups is very important for planning and implementation of sustainable Brownfield management. The main actors can be distinguished and determined as follows according to their interests (REFINA, 2011, p. 118).

Main actors on the municipal level are:

- Policy Makers
- Municipalities

The main private actor groups are:

- User
- Investors, Owner
- Affected people, pressure groups

Complex processes are best understood if they are presented visually. It can help to recognize the centre of action, its dependencies and influences. For a better understanding of Brownfield development processes, the localization of the presented main actors in the process, their interrelationships as well as their reciprocal influences are shown in Figure 7.

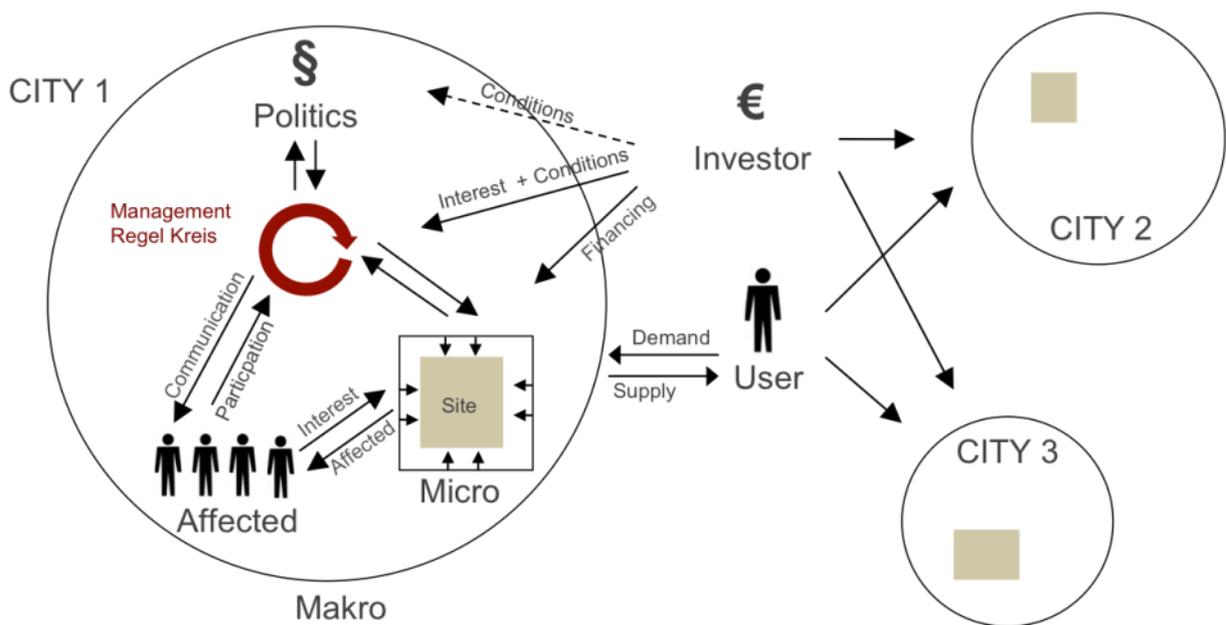


Figure 7; Typological map: Brownfield development and main stakeholder interrelations; Source: Author

If investors and developers feel that the ability of a municipality to streamline redevelopment processes is not convincing, they will opt in consequence for easy and safe Greenfield developments. Therefore, it is important that cities achieve well-established procedures for Brownfield development accompanied by policies and a legal development framework (CABERNET, 2006, p. 83).

5.3 Appraisal of Brownfields

Appraisal of Brownfields is part of the methodology of Brownfield management. It is an important tool for the prioritization of Brownfields to select areas in a municipality that should primarily be supplied for reuse. For an area request of investors municipalities should have prepared an overview of site related key criteria in terms of sustainability, use and marketability in order to deliver adequate sites. The same is true for development carried out by the municipality itself. It should also be possible to determine the best possible usage with a pre-post assessment using the criteria system (REFINA, 2010).

The value of land is assigned by the market dynamics defined by demand and supply. Public interventions have the potential to influence market dynamics and have therefore to be used carefully. "In addition to exercising development control, city planning authorities are called upon to initiate urban regeneration projects and policies and to establish a "ranking system". Local government professionals (urban planners, environmentalists, etc.), argue that some kind of priority list is necessary when defining areas in need of assistance. Local governments' budgets are tight, and public money spent on regeneration schemes has to be well justified" (CABERNET, 2006, p. 82).

In many cases urban development is financed with investors, developers or private initiatives like for example "joint building ventures". Especially for developers and investors, the profitability of a project is the key issue to be proven. Correct and comprehensive assessment of Brownfield characteristics is the basis for a profitability calculation of development projects.

The assessment of Brownfields has therefore three main tasks: It is an important tool to guide development to areas where it is favourable and also expected to be profitable, it is the basis for transparent decision making and finally it helps as an information box to promote Brownfields and to attract investments.

Therefore some methods and models shall be presented, which are helpful to assess contaminated Brownfields from an economic perspective.

5.3.1 The Conceptual Model: The A-B-C Model

The characteristics of Brownfield sites vary greatly from location to location. This has an enormous effect on the profitability of Brownfield development projects. The A-B-C Model was developed to present the economic potential of Brownfields. The economic status of different Brownfields according to the respective categories can be seen in Figure 8.

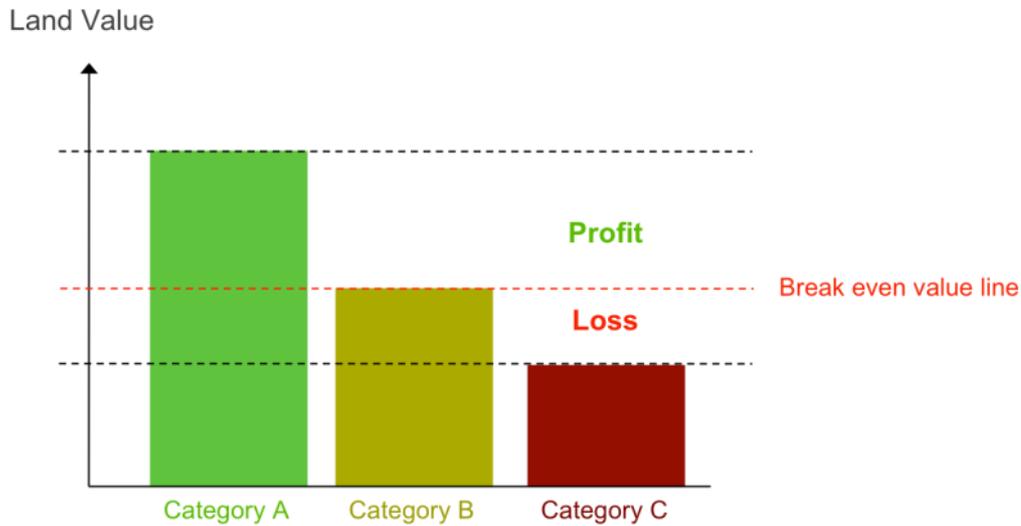


Figure 8; Economic status of A-B-C categories; Source: (CABERNET, 2006, p. 43) Processing by the author

The Model as shown in Figure 9 presents the relation between investment costs for preparation/reclamation and achievable profit due to existing land value reflecting location, former use, treatment costs and economic conditions (CABERNET, 2006, p. 38).

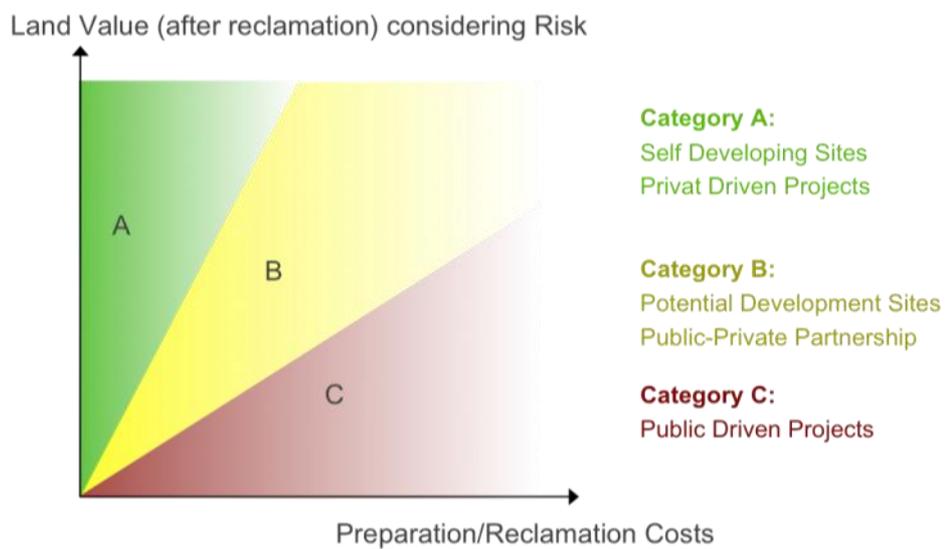


Figure 9; The A-B-C Model; Source: (CABERNET, 2006, p. 44) Processing by the author

Three different land categories, which can be distinguished according to their economic status are identified by the model. These sites are indicated by the preparation and reclamation costs and the land value. According to (CABERNET, 2006, p. 44) sites are categorized as:

- **A Sites** („Self developing sites“) – are highly economically viable and development projects are driven with private funding. Characteristics: earning > cost, prosperous regions, good location.
- **B Sites** („Potential development sites“) – are on the borderline of profitability. These projects tend to be funded through public-private co-operation or partnerships. Characteristics: earnings = costs, prosperous regions, good location, certain risk, profitability is not assured.
- **C Sites** („Reserve Sites“) – are not in a condition where regeneration can be profitable. Their regeneration relies on mainly public sector or municipality driven projects. Public funding or specific legislative instruments (e.g. tax incentives) are required to stimulate regeneration of these sites. Characteristics: earnings < costs, excess of real estate offers, certain risk, no profitability without substantial public funding.

The A-B-C model helps to identify driving forces for the promotion of Brownfield development. It supports both public and private planners to identify adequate strategies to improve economic viability and status of different types of Brownfields. The application of this conceptual model is useful to understand the underlying characteristics of sites that influence re-categorization for example from a B site to an A site. It therefore can be very helpful for the design of site-specific development strategies (CABERNET, 2006, p. 44).

Furthermore ignorance of problems increases uncertainty. Uncertainties influence perception. As a result the range of economic viability can change, is being shifted or narrowed (difu, 2006, p. 50). Categorization of sites can help authorities to guide money to those places where it is most needed, which are B and C sites. It is important to consider that categorization itself already can have an effect on the market value. Therefore planners have to be wary classifying sites in order to avoid drop in the value due to registration or even stigmatization of land (CABERNET, 2006, p. 82).

5.3.2 Land Valuation

According to the German national building code (BauGB § 194) simplified the market value of land is determined by the price that can be achieved at the time referred to by the identification, in the ordinary course of business according to the legal realities and its real properties, other properties and the location of the land without consideration of extraordinary or personal circumstances. It is therefore the objective to identify the probable maximum achievable average purchase price for the property at the valuation date (WertV, 1988) (Wertermittlungstichtag), a fixed point in time of appraisal.

The status of land property in general is determined by (WertV, 1988):

- The entire legal conditions influencing the market value
- Its actual characteristics
- Other compositions
- Its location

The underlying law for the determination of land value specifies more detailed land value influencing characteristics:

- Status of development §4 (Entwicklungszustand)
- Form and extend of structural use §5, Abs. 1 (Art und Maß der baulichen Nutzung)
- Value influencing rights and burdens §5, Abs. 2 (Wertbeeinflussende Rechte und Belastungen)
- Legal status of fees and cessions §5, Abs. 3 (der beitrags- oder abgabenrechtliche Zustand)
- Standby time for structural or other utilisations §5, Abs. 4 (Wartezeit bis zu einer baulichen oder sonstigen Nutzung)
- Composition and character of the land property §5, Abs. 5 (Beschaffenheit und Eigenschaft des Grundstücks)
- Attributes of location §5, Abs. 6 (Lagemerkmale)

In land valuation the existence or even just the expectation of contamination lead to substantial reduction of the market value. This has a great influence on the economic viability of a project and therefore often is the main obstacle for Brownfield development. The estimated risk of existing or potential contamination and its effect on the economics of the project is estimated to be very high (Alfen, 2006, p. 232).

The commonly applied scheme of land valuation is presented in Figure 10.

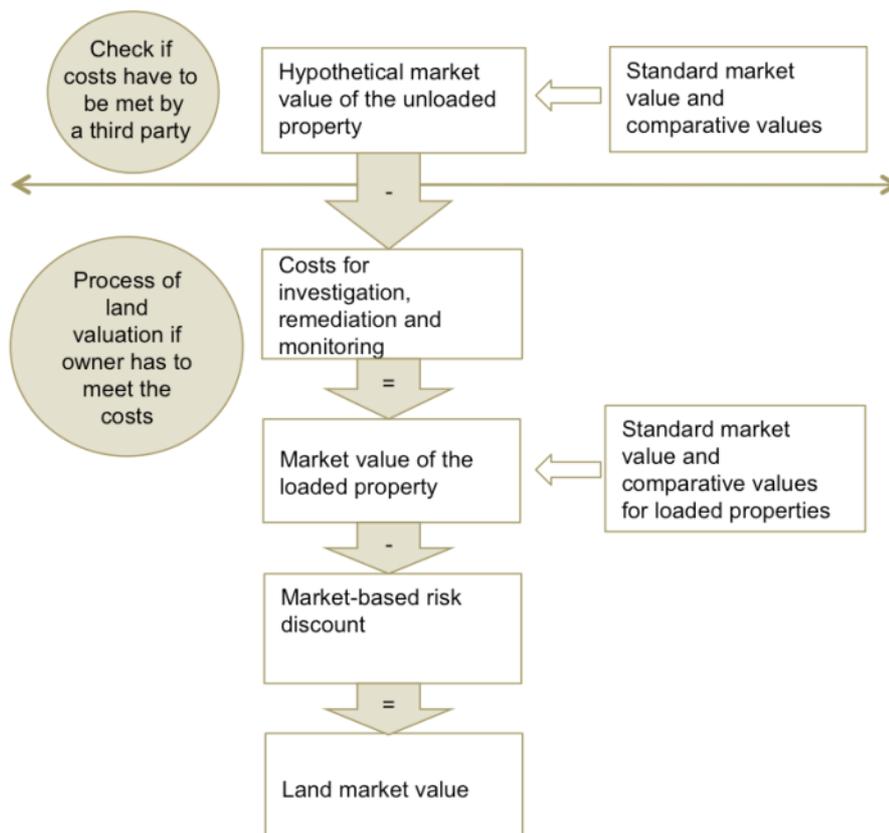


Figure 10; Valuation of undeveloped land with contamination; Source: (Gablenz, 2008, p. 345), Translation by the author

Without considering contaminations the hypothetical market value of the land is estimated according to comparable prices and statistical data supplied by municipalities. The hypothetical market value is then reduced by the estimated costs for reclamation. The calculated land value of contaminated property is then further reduced by the “Market-based risk discount”. The “Market-based risk discount” is a monetized representation of the Stigma, an expected reduction of the land value due to negative perceptions of formerly existing contaminations.

It is mainly not the costs for the remediation of contaminations that lead to the reduction of the land market value but related uncertainties that might negatively influence the development process as well as the future acceptance on the market. Therefore it was understood that the Stigma as a future risk of uncertain costs can just be one component among others (REFINA, 2011, pp. 290-292).

The “Market-based risk discount” comprises then the Stigma and also other Risks as shown in Figure 11.

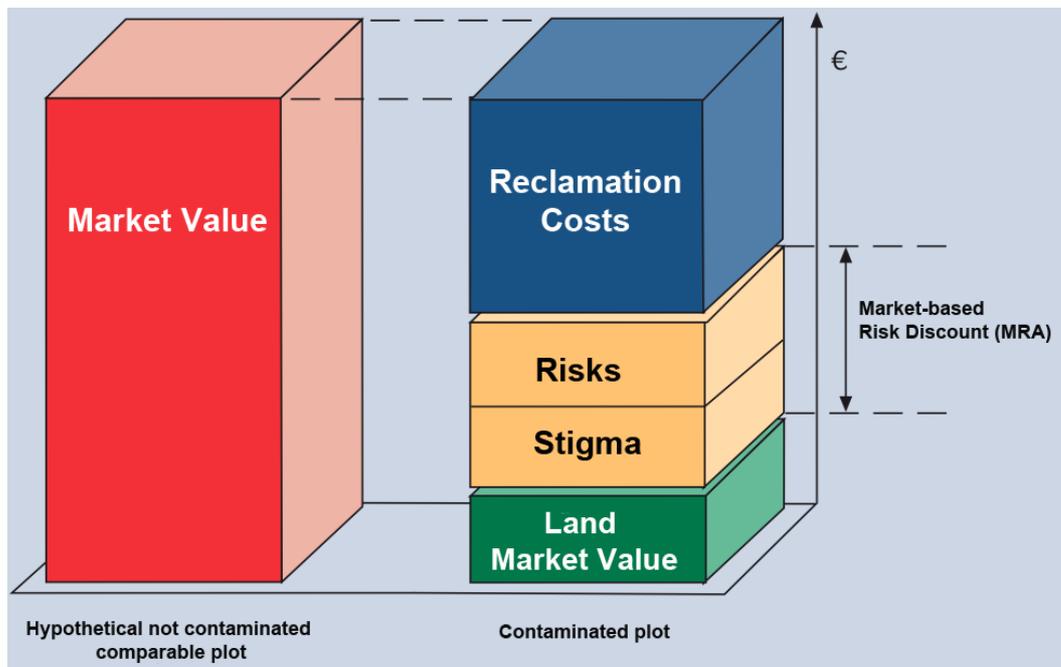


Figure 11; Assessment of contaminated land and market-based risk discount; Source: (REFINA, 2011, p. 291) Translation by the author

As a part of SINBRA project (SINBRA 2009) a concept to determine the Market-based risk discount (MRA) was developed in which these uncertainties, taking it from the perception of market participants can be quantified. Necessary data was acquired in literature analysis, expert interviews, workshops and a nationwide survey of experts by valuation experts. Some time-related components were determined through which the MRA is affected. The concept is an evolution of the classical market-oriented land valuation. It identifies the market's perceived risks of marketing, investment, usability and utilization (see Figure 12). For local authorities, investors and property owners as well as banks and insurance companies, the methodology is also a tool to reach a common language about the perceived risks, costs and value of contaminated plots (REFINA, 2011, p. 292).

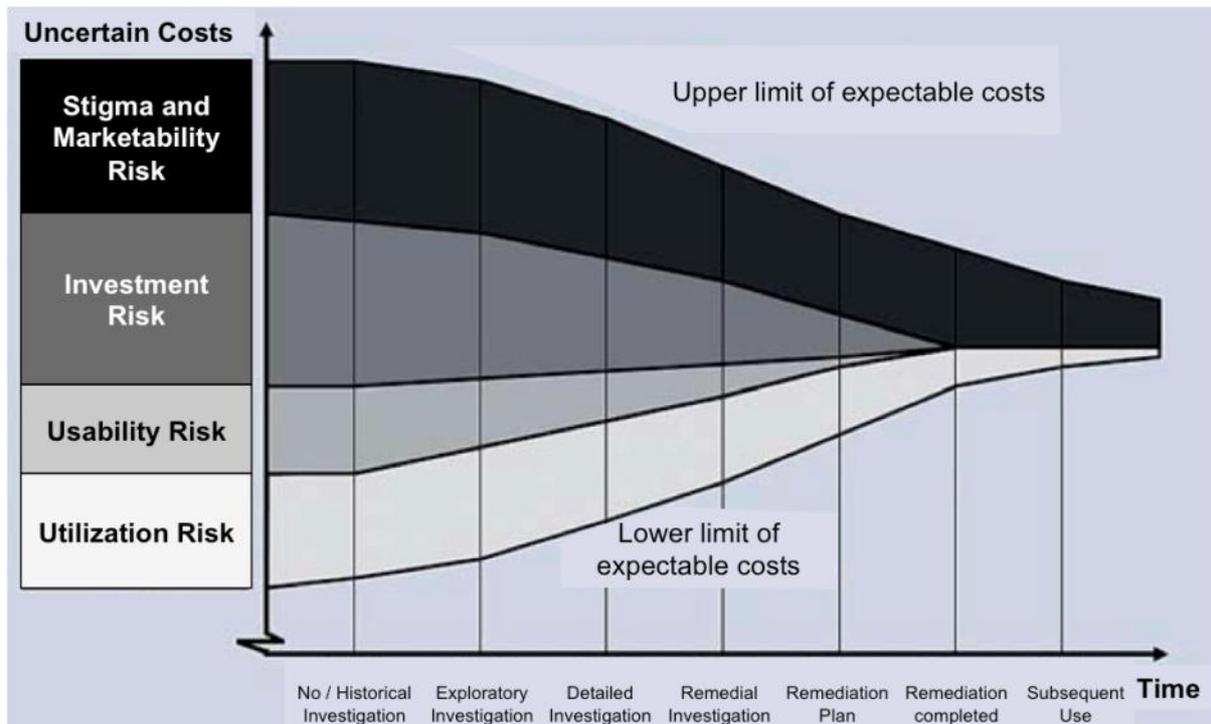


Figure 12; Time-dependent risk component of market-based risk discount; Source: (REFINA, 2011, p. 292), Translation by the author

In the process of land valuation, existing or potential contaminations thus influence the land market value in two ways. The land market value is reduced both, due to existing reclamation costs and due to existing uncertainties related to remediation, revitalization and reintegration of the contaminated site (REFINA, 2011, p. 292).

According to (difu, 2006, p. 56) the Land Market Value (Flächenmarktwert, FMW) is calculated with the following formula while AK considers the Stigma and K considers additional risks of uncertain costs:

$$FMW = (UVW + F) - (GK + AK + SL + P + K)$$

UVW (Unbelasteter Verkehrswert):	Market value of unloaded land
F (Fördermittel):	Available grants that do not have to be paid back
GK (Grunderwerbskosten):	Land acquisition costs (e.g. purchase price, fees, charges, taxes)
AK (Aufbereitungskosten):	Reclamation costs (demolition, remediation and disposal costs, in general: all costs to clear the stigma)
SL (Sonstige Lasten):	Other expense (cost to settle static loads on the property, such as land charges)
P (Planungskosten):	Planning costs (effort to change the designation of planning law, for example, reports, fees, applications)
K (Rendite):	Return (normal return of investment plus risk premium)

5.3.3 Economic Characteristics of Brownfields

For the assessment of Brownfields with regard to their profitability a set of criteria has to be developed. The group of criteria comprises “Regulation and Administration” and the three aspects of economic viability for the categorization of Brownfields according to the A-B-C model: Market Value, Reclamation Costs and Risks. The criteria consider the main aspects of Brownfield management and in addition consist of characteristics for land valuation according to (WertV, 1988), the variables for the calculation of the Land Market Value according to (difu, 2006) and the time-dependent risk component of Market-oriented risk discount according to Figure 12. The assessment scheme for the marketability of Brownfield development scenarios is shown in Table 5.

Group of Criteria	Criteria	Scenario 1	Scenario 2	Scenario 3
Regulation and Administration (BauGB, 1999),(City Chlor (a), 2011)	Influence of policies with preference for inner-urban development			
	Organisation			
	Communication			
Market Value (WertV, 1988)	Status of development			
	Form and extend of structural use			
	Value influencing rights and burdens			
	Legal status of fees and cessions			
	Standby time for structural or other utilizations			
	Composition and character of the land property			
	Location			
Reclamation Costs (difu, 2006)	Demolition			
	Remediation and Disposal (including costs for future observations)			
Risk (REFINA, 2011)	Stigma and marketing risk			
	Risk of investment			
	Risk of usability			
	Risk of utilization			
Sum				

Table 5; Assessment scheme for marketability of Brownfield development scenarios; Source: Author

6 Brownfield Development in Stuttgart

6.1 City of Stuttgart – Figures

The peculiarities of the city's founding and the boundaries of the historical development are cited again and again to explain difficulties and lack of action in the Stuttgart urban development. Surrounded on three sides by hills, which form topographical constraints and their consequences on the development have dominated the city over centuries and will do so to this day (LHS Stuttgart (b), 2004, p. 13).

Stuttgart is the centre of the polycentric structured Stuttgart region and the capital of the state Baden-Württemberg. With its around 2.6 million inhabitants it is not just one of the most populated regions in Germany but also the one with the highest settlement density in Germany (LHS Stuttgart (b), 2004, p. 19). Stuttgart's settlement density amounts to 5572 inhabitants per km². Despite demographic change the predicted overall population growth for Stuttgart amounts to 0.2% in the period till 2025 (LHS Stuttgart (b), 2009, p. 410). But population growth differs a lot within the city itself. Geomorphologic settings and already existing very large settlement densities as well as strict urban development policies limit the available space for growth. Therefore growth is guided to places where development is still possible. In Stuttgart areas, especially along railway tracks and along the Neckar are shaped by former strong industrialization processes. Structural change also takes place in Stuttgart and leads to the formation of inner-urban Brownfields. Highly industrialized districts like Feuerbach and Bad Cannstatt are affected in particular. This is also reflected in the predicted population growth, which is estimated for Feuerbach at 2.6% by 2025 (LHS Stuttgart (b), 2009, p. 382). Stuttgart can be described as a green city. 53.3% of Stuttgart's urban area (Feuerbach 51%) is green comprising space for recreation, forest and arable land.

Despite manageable expected overall population growth there is high development pressure for housing. According to (LHS Stuttgart (b), 2004, p. 39) an additional demand of about 15,000 housing units between 2004 and 2015 was calculated, which results in a demand of about 2000 additional housing units per year. This is due to an increasing number of single households reaching in 2004 already 47% of all households in Stuttgart and continuously increasing living space per person (LHS Stuttgart (a), 2004, p. 25). By 2008 less than 1000 housing units have been completed per year (LHS Stuttgart (a), 2009, p. 116). Building land is a scarce resource in Stuttgart. Areas useful for the development of housing and commerce can mainly mobilized within existing real estate stock predominantly by conversion, restructuring, closing of building gaps, intensification of usage and the activation of Brownfields (LHS Stuttgart (b), 2004, p. 33).

Inner-urban development is strongly supported and promoted by politics and legislation. The Land Use plan 2010 assumes a realistic ratio of existing Brownfield potentials and Greenfield development of 3:1 (LHS Stuttgart (a), 2004, p. 21).

6.2 Instruments for Inner-Urban Development

Qualitative urban planning on a municipal level is not a fast selling item. Already 20 years ago the city of Stuttgart has started to set the boundary conditions to enable sustainable development. This was done on different levels. The legal framework was established to force and secure the stated objectives. Data was acquired and data management systems were established to ensure the basis for decision-making, institutional planning and management. Intensive research and participation in various pilot projects on federal, national, European and international level supports learning processes and the possibility for the application of new strategies and methods, which directly contributes to future oriented development.

6.2.1 Development Policies and Concepts

Vision and ideas are the basis for development. However, it requires clearly formulated goals, strategies and concepts and their binding legal provision to implement them in the planning process as intended. In addition measurable qualitative, quantitative and temporal objectives support the desired success.

Land Use Plan 2010

Stuttgart – compact, urban, green: These are the goals of the Land Use Plan 2010, which is in power since 2000. Following the idea of sustainable development it integrates urban planning, landscape planning and infrastructure planning for the core city of the Stuttgart region. The current land use plan is essentially based on the following guiding principles:

1. Primacy of inner-urban development: The development of Greenfields shall be avoided with clearly stated preferences on the mobilization of Brownfields for inner-urban development. 'Qualified' settlement densities, mixed use areas and the consolidation of district centres shall be promoted. Inner-urban development is also in future one of the most important tasks of urban development in Stuttgart. Also densification measures are to be considered.
2. Integration City – Landscape: Inner-urban green areas for recreation shall be provided as open public space for the inhabitants. Those green areas shall be connected with green corridors and renaturated Brownfields to establish a green network.
3. City compatible traffic: Traffic shall be avoided by reasonable combination of uses, securing necessary traffic for commerce, promoting public transport and traffic calming measures to protect sensitive urban areas in particular housing.

The land use plan is conceived as a planning tool with an integrative approach. Measures for the development of new housing also have to consider necessary green areas and adequate transportation (LHS Stuttgart (a), 2004, pp. 17-18).

Soil Conservation Concept Stuttgart (BOKS)

"Land use" is often synonymous with "soil use". Usually this means the conversion of open space into developed land or traffic area. In the course of such uses, impairments of individual soil functions often lead to the total loss of the soil function.

The “soil conservation concept Stuttgart” (BOKS) deals with methods and strategies for the sustainable use of “soil” as a valuable resource. BOKS allows sustainable management of local land inventories and ensures that land use is projectable, measurable and controllable. It is based on a planning map, which classifies the existing soils in an understandable form according to quantity and quality. With help of this map, soil uses can be accounted for applying the so-called soil-indication. The intention of the BOKS is to show planners and policy-makers adequate strategies and objectives along with associated interactions necessary for sustainable municipal soil conservation.

Since March 2006, the BOKS is a binding part of land use planning in Stuttgart. In the medium term the two approaches, the BOKS, carried out by the Environmental Protection Office and the NBS (Sustainable Land Management Stuttgart), carried out by the Urban Planning Office shall contribute to avoid new consumption of semi-natural soils and to cover the need for land using existing inner-urban sites. This shall be achieved through increased interior space compression, revitalizing derelict and often contaminated areas as well as the conservation of valuable and sound soils.

An interim report carried out on the implementation of the BOKS for the observation period May 2006 and May 2008 showed that consistent internal development and temporary freeze of new land consumption is feasible (LHS Stuttgart (a), 2006).

Urban Development Concept (STEK)

The “Urban Development Concept”, also known as the STEK (Stadtentwicklungskonzept), aims at presenting comprehensively the development potentials of Stuttgart and shall rule as a framework for orientation and decision-making. The STEK therefore is meant to be a long-term sustainable urban development concept for Stuttgart. The elaboration of the “Urban development concept for Stuttgart” follows a “three step” procedure comprising the elaboration of a “draft” in 2004, the involvement of the public called “dialogue” in 2005 and the elaboration of the “strategy” in 2006 considering received objections. The document focuses on different fields of action and strategies considering housing, economy, social aspects, open space and agriculture, transportation, culture and education as well as leisure and sport. The main statements of the concept are expressed with guiding principles and emphasize on lead projects for the different areas within the city. The STEK aims at (LHS Stuttgart (b), 2004, p. 8):

- The balance between economic, ecological and social interests.
- The implementation of recognizable trends of demographic and economic development.
- The determination of the role of the inner city within the region.
- The clarification of synergies between the numerous programs and projects.
- The promotion of public dialogues on future urban challenges.

Analysis of the existing situation and derived possible future trends are the basis for planning. Planning then considers these inputs to enable sustainable urban development. As in any other city, Stuttgart faces challenges induced by structural change currently taking place including changes in the population structure, economical transformations (industry and services), modernization processes and the increasing demand for citizen services. “Additionally, in a globalized world, cities face an aggressive competition for investments and qualified human resources. The urban development policies are looking for ways to position Stuttgart as a strong and attractive location for the economical sectors, and a qualitative living space for its citizens” (Leyva Douat, 2009, p. 113).

The accentuation of the following lead projects is proposed by the (LHS Stuttgart (b), 2004):

- “Living in urban areas and the renaissance of public space” – Lead project with concentration on the revitalization of the city centre
- “Industrial locations in transformation” – Lead project with concentration on the north of Stuttgart
- “River landscape of the future” – Lead project with concentration on areas along the River Neckar
- “New scientific landscape” – Lead project with concentration on the districts of Vaihingen and the Filder.

The Concept for urban development is not legally binding but rules as an overall concept for urban development with a time frame of about 15 to 20 years (Leyva Douat, 2009, p. 113).

6.2.2 Data and Data Management

As already mentioned the availability and efficient management of data is the basis of sustainable development. Complexity and interrelations of needs planners have to deal with can just adequately being considered if sufficient and correct data is acquired and visualized. Comprehensible representation of data using abstract models requires the application of data management systems. This is essential as a basis for decision-making as well as for the transparency of planning processes. Citizens should be able to understand development actions of planning authorities.

For more than twenty years the city of Stuttgart is already working in the field of data management systems to continuously improve existing instruments for efficient and sustainable Brownfield development procedures. (Leyva Douat, 2009, p. 116). This section deals with such instruments applied in Stuttgart.

Internal Information System Stuttgart (SIAS)

Geo-information provides valuable decision-making basis and are therefore of great importance for the city administration. SIAS, the city's “internal information and geographical information system” is a citywide Geo Information System (GIS), which is employed for data acquisition and serves as an information platform of spatial data. The client-server system provides base technology for many professional applications such as: waters information system, social infrastructure, green space management, sustainable land management, monument conservation, infill land cadastre, street cleaning AWS and thus represents a geo-information-based system within the state capital Stuttgart. Information from ISAS (see below) can also be displayed. Comprehensive and current geo-data of the municipal offices and municipal enterprises are quickly accessible and clearly represented.

SIAS is currently used in 30 offices and municipal enterprises of about 1900 users. The content available represents a cross section of data from 10 offices and is described in the geo-metadata-information system GeoKatalog (LHS Stuttgart, 2010).

Sustainable Management of urban areas Stuttgart (NBS)

The system called “Sustainable management of urban areas” was introduced in 2001. Since then it has contributed greatly to the inner development of the city of Stuttgart. Initially the project started as a state research program but became the most important instrument for sustainable urban development applied by several departments of the municipality of Stuttgart. As a main objective the NBS establishes strategies and tools to activate all potentials for inner-urban development like Brownfields to bring them back to the market. This is to generally reduce urban development on Greenfields using existing derelict and abandoned sites

within the city. Thus optimal urban densities, mixed uses, centrality and accessibility according to the Land Use Plan 2010 shall be implemented.

According to (LHS Stuttgart (a), 2003) the three main components of the project can be summarized as follows:

1. Data acquisition and development of an up to date catalogue containing all existing potential developing areas. These areas are characterized by:
 - Size: Sites with a minimum of 2000m² potential additional floor space.
 - Legal framework: Sites identified as building areas in the land use plan or with valid building law displayed in the implementation plan.
 - Development potential: All desirable urban development potentials without consideration of existing obstacles for realization. Green areas are not considered. Planning horizon: Expected possible time for realization 10-15 years. Visionary potentials are not considered.

2. Data management: The construction of a GIS based information platform, which can be permanently updated and presented on the Internet. The essential information of each site is acquired graphically and numerically and included in a database. For each site an “area pass” is created, in which the most important characteristics are represented. In addition the passes include among others photos, plans, maps and video sequences (see Figure 13). Via Internet the information platform can be accessed and updated by planers and experts in the Urban Planning Department as well as by other municipal departments. Additionally, the general public and possible investors have access to information regarding the areas through the Internet and can retrieve facts about the area of interest according to the different districts of the city, the size of the plots or the land use.

Area information in the NBS	
<ul style="list-style-type: none"> ▪ Location and transport connections ▪ Aerial photo and section of the city map ▪ Photos ▪ Size 	<ul style="list-style-type: none"> ▪ Situation of contaminations ▪ Ownership structure ▪ Current building law ▪ Urban development ideas

Figure 13; Area information stored in NBS; Source:(KMU, 2009, p. 5), Translation by the author

3. Strategic and conceptual approaches: Strategies and concepts are formulated to activate in particular privately owned areas for potential development. This is done to demonstrate options for future actions within the municipality and for necessary inputs in order to accelerate construction processes by correcting infrastructural deficits, creating the necessary legal framework and by investigating possible contamination. New strategies shall be based on five “fields of action”, which were determined for this component: organization, communication/marketing, urban planning, management of areas and contamination. The strategies aim at increasing efficiency and transparency of municipal planning processes by integrating all the actors participating in its different phases.

The NBS comprises Brownfields, gaps between buildings, underused areas, conversion areas and new areas throughout the city. In Stuttgart most of the registered areas are smaller than 5 hectares.

“Sustainable management of urban areas” is a permanent challenge since the city is constantly changing. This requires the NBS continuously to be updated and adopted to current needs. Thus the city has a tool, which enables a recent overview of inner urban development potentials. It is therefore an example of how Brownfield management as a municipal task can be strengthened (LHS Stuttgart (a), 2003).

Since 2007 the NBS is integrated in the Geographic Information System of the City (SIAS). Thus, the direct link with the real estate data, the data for planning law and the contaminated land is made (LHS Stuttgart (c), 2008, p. 7). Sites below the threshold of the NBS (2000m² potential additional floor space) are registered in the cadastre for “Vacant lots”. Since 2007 this cadastre is integrated in the municipal GIS SIAS. This makes it possible to create a total balance of all potential building sites in the city. An additional recording of “underutilized” infill, additional comprehensive survey of vacant lots in commercial areas, vacant lots and new action for the activation of gap sites still has to be conducted (LHS Stuttgart (c), 2008, p. 7).

Information System of contaminated urban areas Stuttgart (ISAS)

ISAS the “municipal information system of contaminated sites Stuttgart” digitally stores and processes information about contaminated or potentially contaminated sites in Stuttgart surveyed since 1993. To avoid redundant data and to keep the system as simple as possible ISAS is linked with SIAS the Spatial Information Access Service, the central Geo Information System of the city of Stuttgart and WAABIS (Water Waste Brownfield Soil Information System) of the state of Baden-Württemberg. Therefore just data relevant for the processing of Brownfield sites must be acquired (LHS Stuttgart, 2002).

Existing contaminations are obstacles for development mainly due to very high costs for remediation. ISAS is an important instrument to actively manage and visualize data about contaminations or suspected contaminations as a solid basis for the mitigation of environmental risk and negotiation with polluters and developers. Several municipal offices have to deal with contaminations. It is therefore a very successful contribution for the management of contaminated sites and urban development.

ISAS also works as a Brownfield cadastre. Systematic registration of all areas suspected to be contaminated makes it possible to know today exactly which sites are expected to contain harmful substances and their status of investigation or remediation. Different states of Brownfields are differentiated according to the status of investigation and degree of contamination (see Figure 14). The risk for the environment finally is responsible for prioritization of remediation activities.

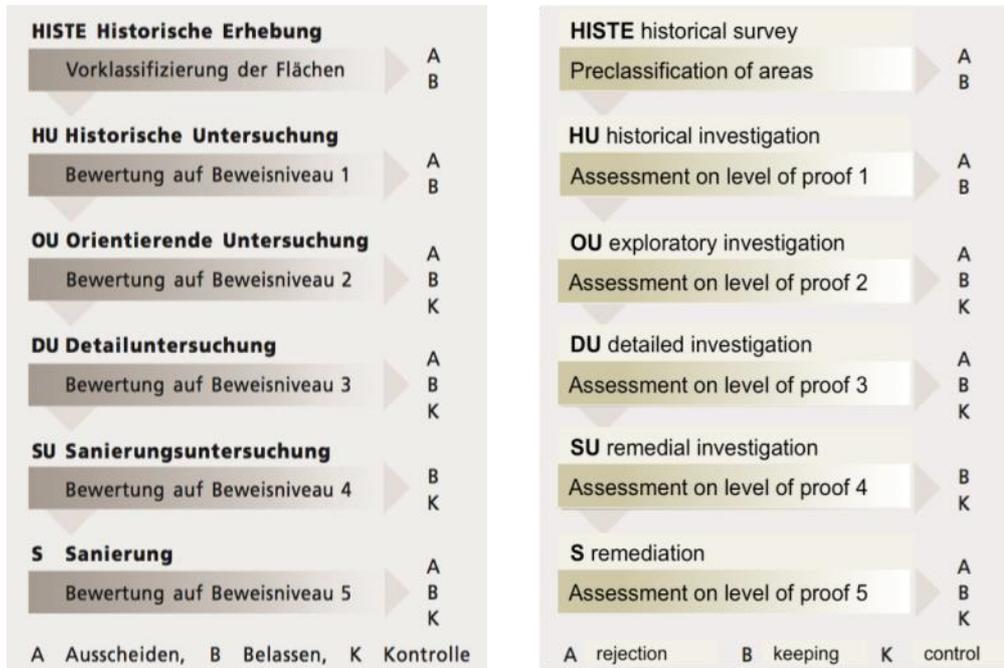


Figure 14; Investigation procedure of contaminated and potential contaminated sites; Source: (LHS Stuttgart, 2002), Translation by the author

In this way, experts can already develop adequate solutions at an early stage of redevelopment, which guarantee both the required environmental remediation and a sustainable, efficient, and economic realization of Brownfield revitalization projects.

Online Geo Information System (GEOLiNE)

Since 2006 the state capital of Stuttgart offers an online geographic information system (GIS). GEOLiNE is a web-based geographic information system, which is available via the intranet to all employees and staff inside the city of Stuttgart. The system provides spatial information and allows the combined representation of different themed levels. It provides graphical and spatial query and relevant functions. GEOLiNE has an interface easy to use and is aimed at all employees who need geospatial information in their work (LHS Stuttgart (b), 2006). The content ranges from the basic digital city map (with parcel representation), on aerial photographs to specialist information such as the land value map. The Survey Agency of Stuttgart provides the web technology and the basic geographical data and thus allows interested customers to optimize the use, ease of integration and the rapid availability of geospatial data for their business processes (LHS Stuttgart, 2010).

Municipal Online Information System for Statistical Data (KOMUNIS)

Using KOMUNIS the Statistical Office provides relevant information with defined quality and timeliness for decision-making to all fields of politics, technical offices and is partially via the Internet also accessible for the public. For rapid economic and policy decisions and administrative area, it is important that the required structured information is available at anytime and anywhere. This task presented the council in 1994 to the Statistical Office with the mission to build the local online information system KOMUNIS gradually.

The technical platform on bases of a marketable document management system was implemented in the existing urban network. With the expertise and the logistics of the statistical office, knowledge and data sources were systematically collected, processed to get information documents, structured and retained in a database. This information is continuously further optimized by the latest information received, visualized and represented also as small-scale geographic information according to data protection regulations. The information system relies on its sources. There are data from own-local statistical surveys such as the citizen survey and the rent index as well as data from the administrative enforcement, which is sent to the Statistical Office (LHS Stuttgart (b), 2003).

Mobilization of Building Land Resources (Management of Gaps between Buildings)

See also "SIAS"

6.2.3 Funding

Brownfield development often fails due to required high rates of return from the investor`s perspective, high risks or unfavourable conditions. This is mainly true for so called C-sites (see chapter 5.3.1) (KMU, 2009, p. 9). Public initiatives are necessary to enable revitalization and development. Funding is an important instrument to promote and support inner-urban development especially in cases where development is of public interest or would not take place without promotion as for example the construction of housing for families. In Stuttgart funding programs and consulting services are provided through the following authorities: the Office of urban planning and renewal, the Office of real estate and housing, the Office of environmental protection and the Economic development.

This is also in a line with the policies and strategies for sustainable inner-urban development. The following funding programs are available:

Promotion of Urban Development + Renewal	Limited / Preconditions
Residential Housing Development Promotion	Limited / Preconditions
Special Program (Brownfield)	Limited / Preconditions
Consulting Service	Unlimited / without Conditions

Figure 15; Existing funding programs and counselling services; Source: (KMU, 2009, p. 10), Author

Funds are always limited and specific preconditions have to be fulfilled. The conditions differ according to the funding program. The complete list of available funds in Stuttgart can be seen in Annex 1. Funding is a direct input to overcome existing obstacles hindering urban development. Municipal promotion programs aim at supporting and steering of development processes in the sense of the public. Experiences show that funding

is a very helpful instrument to initiate and speed up development processes and also to increase transparency and public influence (KMU, 2009, p. 10).

Consulting services can decrease costs and financial support increases return (see Figure 16).

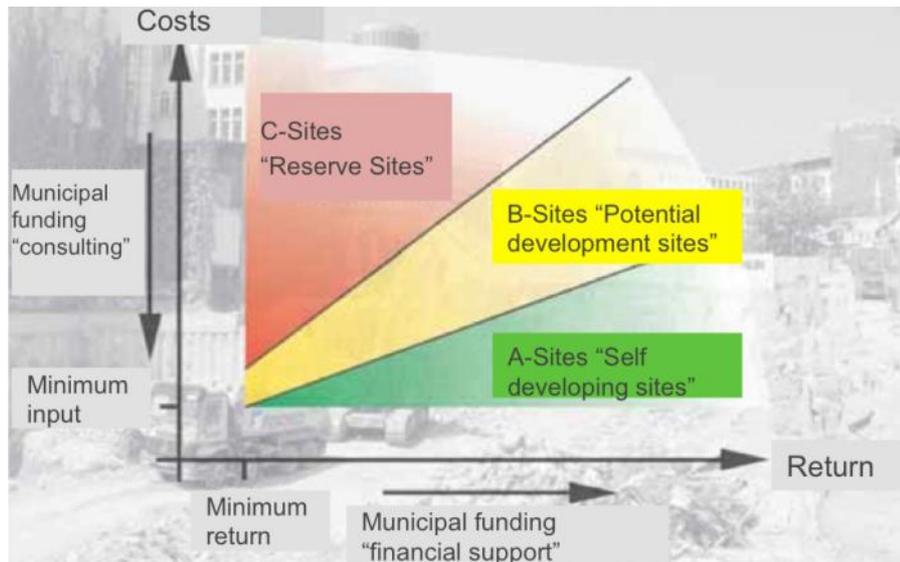


Figure 16; Municipal Funding Program; Source: (KMU, 2009, p. 10), Translation by the author

There are mainly two funding programs dealing with Brownfield development. One is settled at the Office of urban planning and renewal, responsible for urban measures and the other is settled at the Office of environmental protection, responsible for environmental measures.

Funding, which is related to Brownfield development is awarded for urban renewal activities (§ 136 et seq. (BauGB, 1999, pp. 80, §136 et seq.) and urban development activities (BauGB, 1999, pp. 98, §165 et seq.). Its dedication is regulated in the code of German building law BauGB §164. Funds are available on the European, national and federal level and are awarded for the integrative preparation and accomplishment of urban development or renewal measures and their related necessary activities as among others: preparation §140, accomplishment of alignment §147 and construction measures §148 as well as the implementation of the social plan § 180/181. This funding aims especially on the (BauGB, 1999, pp. 98, §164b):

- Enforcement of city centres and urban districts centres with main focus on housing and heritage.
- Reuse of inner-urban Brownfields especially for housing, workplaces and public infrastructure with the consideration of both, mixed uses and environmental friendly, cost- and space saving design.
- Urban measures for the adjustment and elimination of social deficits.

Funding, which is related to Brownfield remediation is awarded for nationwide coverage of suspected areas and the treatment (investigation, remediation and monitoring) of municipal suspected and contaminated Brownfields (section II) and the treatment of none municipal suspected and contaminated Brownfields (section III). The fund is provided by the federal state of Baden-Württemberg. Current legal basis for awarding grants are the „guidelines on the promotion of measures to detect and treat potentially contaminated sites

and contaminated sites“ (FrAI) of 14 December 2004, which entered into force on 1.1.2005. The acquisition and exploratory research is funded at 100%, detail and remedial investigation and remedial measures are funded in the form of equity financing at 50-75% (LUBW (a), 2011). The procedure of the treatment of contaminated sites is regulated in the “National Soil Protection Law” (BBodSchG). The acquisition of Brownfields is in the responsibility of the federal states and regulated in the “Federal Soil Protection and Brownfield Act” (LBodSchAG) (LUBW (b), 2011). The dedication of funds is according to the mentioned guidelines and the budget code of Baden-Württemberg (§23, §44 LHO). The funding aims on the acquisition and reduction of risk for man and environment caused by contaminated Brownfields and their statewide systematic treatment as a contribution to the reduction of utilized land. Measures supporting the preservation of workplaces are of preference (Ministerium für Umwelt und Verkehr, 2005).

In addition the city of Stuttgart provides funding for the investigation and remediation of municipal Brownfields, which are not funded by the FrAI (LHS Stuttgart (a), 2003, p. 131). Costs arise on different project levels and have to be financed by either the public or private sector. In Figure 17 provided funding programs are shown related to the level of development.

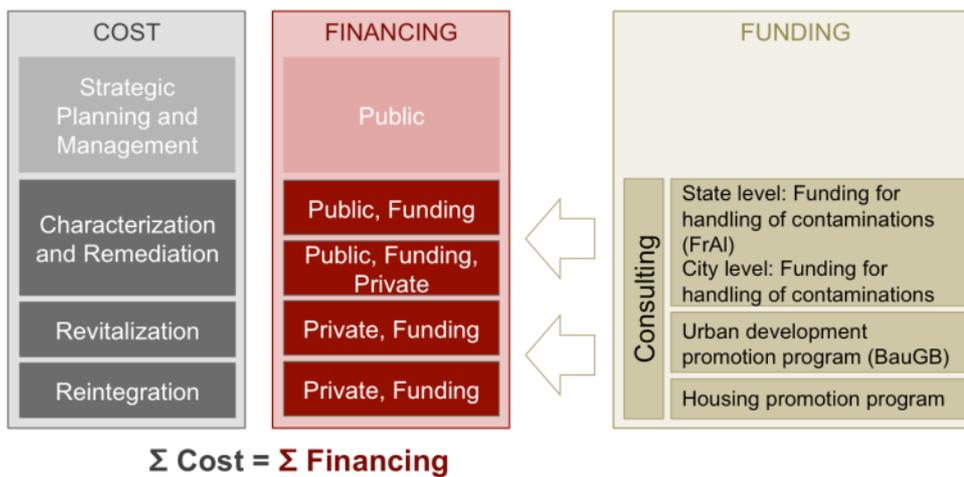


Figure 17; Cost and financing of Brownfield development considering public property; Source: Author

6.2.4 Research and Pilot Projects

In the previous years the Municipality of Stuttgart has participated in various research and pilot projects funded by programs of the European Union, the German government or federal ministries. Pilot Projects provide great opportunities to find new or alternative solutions, improve methods, gain knowledge and experience, creating networks and finally to develop real projects of high complexity and problematic background, which would not have been possible without funding. Many of these projects dealt with the need for the development of contaminated Brownfields in the context of sustainable urban development. This section presents some of these projects according to their positioning in the process of sustainable Brownfield development: remediation, revitalization and reintegration. The examination of already completed research and pilot projects intends to learn from the experiences of these projects. An important objective in participating in research projects was to build on existing or completed projects. In this way a holistic view on a specific research topic shall be achieved. The sequence and the classification of the project CityChlor is part of this section.

The State Capital Stuttgart is a metropolitan area with diverse industries. At the same it owns Europe's second largest mineral springs with a discharge of ca. 500 l/s.

Due to numerous industries large-scaled groundwater contaminations occurred. To protect groundwater and mineral water resources but also to support urban development Stuttgart did pioneer work for integral management of groundwater contaminations. Fifteen years ago Stuttgart struck a new path to investigate its groundwater extensively and since then has participated in different research projects concerning integral groundwater investigation and remediation. CityChlor can be seen in line with research projects like among others INCORE, MAGIC and FOKS (see Figure 18). These projects have in common their focus on integral approaches to investigate and remediate contaminations especially with environmental effects on groundwater applying innovative methods and techniques and to implement alternative strategies for daily practice. The specialty of CityChlor can be seen in its approach to already integrate remediation procedures on the level of urban planning (FOKS, 2011).



Figure 18: History of EU research and pilot projects in Stuttgart concerning integral groundwater investigation and remediation; Source: (FOKS, 2011)

Integrated Concept for Groundwater Remediation (INCORE)

“In INCORE results elaborated the Neckartalaue-project were transferred to the European dimension. Stuttgart's part in this project was also realized in the industrial area Neckartalaue. Together with European partners a targeted strategy was developed for integral groundwater investigations, comprising three cycles as follows: First: Plume screening, Second: Source screening and Third: Source/Plume remediation. This resulted in a decision support tool for in-situ remediation techniques, laid ISIRE (In Situ Remediation techniques)” (FOKS, 2011)

Management of Groundwater at industrially contaminated Areas (MAGIC)

“MAGIC's character was more demonstrative, aiming not so much at research, but more at application of integral methodologies. Findings and methods developed in INCORE were applied to a multi-storey fractured aquifer in Stuttgart-Feuerbach. Considerations focused on chlorinated solvents as an extremely persistent contaminant difficult to trace especially in fractured aquifers. The strategic approach developed in INCORE was additionally supplied by the set up of a numeric groundwater model. Finally the spatial distribution of 118 plumes has been determined, stretching in three dimensions over 5 groundwater aquifers. Maps of sources and plumes in the five different aquifers were produced and compared in a 3-dimensional way. On the basis of the calculated source strength and plume length two priority lists were established” (FOKS, 2011).



CityChlor

“This project develops an integrated approach for a technical and socio-economic management of sites contaminated with chlorinated solvents in soil and groundwater in urban areas. Within CityChlor thermal remediation techniques as an innovative environmental technology will be implemented at a Pilot Site in Stuttgart-Feuerbach. However CityChlor does not only deal with integral investigation and remediation technologies but also comprises risk assessment and communication, urban planning and socio-economic aspects. So the term “integral” will be extended to an interdisciplinary approach of urban planning and development” (FOKS, 2011).

Focus on Key Sources of Environmental Risk (FOKS)

“FOKS deals with management of groundwater pollution by priority industrial pollutants. It is the project’s general approach to take up innovative tools and strategies developed by recent research and to transfer them to daily practice in groundwater risk management. This strategy facilitates fast implementation and optimal use of research results and it allows the water authorities to build their practical work on a sound scientific basis.

The FOKS project general objective is to focus the remediation efforts in degraded areas on the key sources of contamination” (FOKS, 2011). Other projects like PROSIDE, REVIT, KMU KMF as part of the REFINA studies and COBRAMAN moreover deal with the revitalization and management of Brownfields as part of sustainable urban development.

Promoting Sustainable Inner Urban Development (PROSIDE)

“The overall objective of the PROMoting Sustainable Inner urban DEVELOPMENT (PROSIDE) project is to ensure coherency and compatibility between private investors’ plans and municipal needs for sustainable urban development within a short and appropriate timeframe while enhancing the remediation of industrial sites using private funds. PROSIDE aims to support spatial planning policy on prevention or mitigation of environmental damage related to industrial pollution and on-going urbanisation. . Facilitating communication between the stakeholders concerned should encourage private investors to develop their projects based on the principles of sustainable development and remediation of Brownfields. PROSIDE activities cover three key components: First Communication and Stakeholder Management; Second Planning Process; Third Environmental requirements”(PROSIDE, 2006, p. 2).

Revitalization of small and middle sized Brownfields (KMU entwickeln KMF)

The research project “KMU entwickeln KMF” (“SMC develop SMS”) concentrated on the development of “small and medium-sized sites” (SMS, area size less than 5 hectares) by “small and medium-sized companies” (SMC) and is part of the REFINA program “Research for the Reduction of Land Consumption and for Sustainable Land Management”, which was launched in 2006 by the “Federal Ministry of Education and Research” (BMBF) as part of the German National Strategy for Sustainable Development. An important component is the strengthening of inner-urban development through the reuse of Brownfields. The national set goal is the reduction of land consumption to 30 hectares per day by 2020. Strategies and innovative approaches shall be developed to reduce demand for urban land and to offer tools for sustainable land management. Developed approaches and strategies are tested and applied on pilot projects by implementing new instruments and procedures

(LHS Stuttgart (h), 2011). "The significance of sites less than 5 hectares for inner-city redevelopment was demonstrated as main result of the project "Sustainable Building Site Management in Stuttgart (NBS)". The reuse of SMS can make a significant contribution to the reduction of Greenfield consumption. However, there are also some problems, which need to be mentioned, e.g. structural development limitations and contaminations. In addition, the town council has to coordinate the different stakeholders and has to act in a flexible way. For these reasons, site revitalization is often time-consuming. However, SMS represent an optimal project size for SMC" (REFINA, 2009).

According to (LHS Stuttgart (h), 2011) the alliance partners from science and industry supported the city at the pilot locations with the following skills and activities:

- External communication, facilitation, mediation
- Application of cooperative planning processes as an informal planning tool
- Development of a funding strategy for the reactivation of small and medium sites
- Development of a SMC strategy for dealing with Brownfield land
- Development of marketing strategies
- Development of a building demolition tools

Central for the project was the testing of a field related project management. The development and application of an area-oriented management approach is used to improve the internal flow of information and communication as well as between urban investors, owners and the municipal offices. The aim was to eliminate the barriers outlined above to reintegrate those areas into the market cycle by the application of individual packages of measures as well as to attract potential investors (LHS Stuttgart (h), 2011).

Manager Coordinating Brownfield Redevelopment Activities (COBRAMAN)

COBRAMAN aims on developing a new job description of a local "area development manager" and focuses on project managers who will guide and support land recycling processes. During the project period, future land development manager will intensively be trained „on the job“ in Stuttgart and with the other project partners. The know-how acquired will be used in the future. Internationally the profession is known as "Brownfield Manager".

Already in the previous EU projects "REVIT" and "PROSIDE" where the city of Stuttgart has been involved, innovative revitalization techniques and methods were explored. To bring together existing knowledge in a database is another objective of the project COBRAMAN. The aim is to develop a management plan for the revitalization of inner-urban areas, which can be applied across Europe by all professionals involved in the process of inner-urban development. The accumulated knowledge is tested by the new "Brownfield Manager" on selected project areas in the form of "best practice" cases. The acquired expertise together with the generated management concept for area development will lead to a simplified and streamlined approach for the reuse of inner city land and thus to shorter decision and processing times (LHS Stuttgart (a), 2011).

6.2.5 Interim Summary of Urban Development Instruments

As a result of the information presented so far in chapter 6.2 it can be recognized that in Stuttgart a great variety of diverse instruments for inner-urban development is already in place.

Laws and Policies

Existing spatial planning law and development policies create substantial support for the implementation of sustainable Brownfield development. With the policy of “Inner-urban development prior to external development” growth is directed to existing potential inner-urban areas and development on Greenfields is limited substantially. The ratio of Inner-urban development to Greenfield development accounts in Stuttgart meanwhile for 5:1 in 2011 (INTEGRATION, 2011). Additional policies request optimized urban densities, mixed uses, high environmental standards and priority for development nearby commuter railway stations and illustrate further criterias to achieve sustainable urban development and thus to increase the possibilities for Brownfield development.

Data and Data Management

Comprehensive and available continuously updated data for municipal planning as well as adequate and integrated data management tools like SIAS and NBS strongly assist organization, communication and planning processes for inner-urban development within the municipality. As a semi-public web-based information platform the NBS contributes to information and communication with investors and other private stakeholders and can be seen as a linking tool between public and private interests. It comprises information about available development areas > 2000m² potential additional floor space in the city including information about development potentials using test planning. Areas for development <2000m² potential additional floor space are stored as infill potentials in the SIAS. All relevant information can be overlaid as for example ownership structure or existing contaminations.

Funding

Funding programs in Stuttgart are located at different responsibilities according to their affiliation. Funding in Stuttgart is available for the public in the field of urban development and renewal as well as for investigation and remediation of contaminated municipal properties. Funding within designated urban renewal areas is also awarded to citizens comprising direct and indirect financing via tax privileges for refurbishment of the housing stock. Funding is related to specific conditions, which ensure the implementation of municipal interests.

Measures for which funds are available are clearly determined. This becomes complex when dealing with Brownfield development, which requires differentiating between below soil and above soil funding. Funding to promote the construction of affordable housing is also awarded to investors and can therefore also be seen as a contribution to Brownfield development.

In the last years provided financial means for remediation of municipal Brownfields continuously decreased. Thus funding especially for Brownfield development of B and C-Sites is an instrument of outstanding importance.

Research and Pilot Projects

The presented research and pilot projects were initiated as a contribution to sustainable inner-urban development in Stuttgart. As inner-urban development mainly takes place on Brownfield sites suspected and perceived contaminations were considered and dealt with at different levels of sustainability:

The projects INCORE, MAGIC, FOKS and MAGPLAN mainly deal with the question of investigation and sustainable remediation, the environmental perspective of contaminations in inner-urban areas. Other projects like PROSIDE, KMU KMF, COBRAMAN mainly deal with the challenge of coordinating and managing revitalization and the possible reintegration of Brownfield sites.

CITYCHLOR deals with both, investigation and remediation of contaminated Brownfields linked with socio-economic aspects dealing with integrated management from the public perspective and its influences on the reintegration of these Brownfields in the economic market cycle. The specific characteristic of Chity Chlor is to deal with very small highly contaminated sites. The analysis of socio-economic aspects investigates effects of Integrated and Area-oriented approach on the marketability of these sites as a contribution for sustainable inner-urban development. Table 6 illustrates the different objectives of the presented Research and Pilot Projects according to the different stages of sustainable Brownfield development.

	Investigation + Remediation	Revitalization	Reintegration	Regulation + Administration
INCORE	x			
MAGIC	x			
FOKS	x			
CITYCHLOR	x	x	x	x
PROSIDE	x	x	x	(x)
KMU KMF	(x)	x	(x)	x
COBRAMAN	(x)	x	x	x

Table 6; Objectives of Research and Pilot Projects, Source: Author

Summarizing the results of the various projects from the public perspective dealing with sustainable urban development it became clear the:

- Importance of supporting policies and concepts for inner-urban development to guide and define the process of sustainable urban development.
- Importance of comprehensive available information about contaminations, its effects, remediation strategies and related costs to reduce uncertainties.
- Importance of accessibility of information about inner-urban development potentials (NBS).
- Importance of communication between public authorities, investors and affected stakeholders.
- Importance of (integrated) planning considering various aspects.
- Importance of organizing and managing Brownfield development as interdisciplinary and cooperative processes integrating all related aspects to achieve sustainable inner-urban development.
- Importance of funding programs as necessary supporting instruments to initiate Brownfield development for difficult cases (B and C Sites).

Participation in Research and Pilot projects demands much effort for necessary application as well as for its implementation. The municipality of Stuttgart is very active in participating in numerous diverse of these

projects. The city benefits from funding of pilot projects and innovative methods applied. As a result problematic urban situations can be solved, data is acquired, specific knowledge is attained and administrative processes can be improved.

In order to generate further values expert knowledge and innovative procedures should be distributed equally among the working staff.

The knowledge attained during several subsequent Research and Pilot projects in the field of soil and groundwater contaminations considerably can reduce risks in the project area and therefore contributes to the marketability of the area.

As part of successive research projects in Feuerbach, CityChlor can already setup on the results achieved.

6.3 Practice of Brownfield Development (Management)

The analysis of existing policies, tools and research projects in the previous sections has shown that Stuttgart has already done many things towards future oriented urban development. It can also be seen that it is a long process in which Stuttgart stepped into already at an early stage more than 20 years ago. As a result various innovative instruments have been installed and experience gained over time was also a contribution to international research programs in Latin America. One can see, that the achievement of sustainability is complex, demanding and an ongoing process, which requests a lot of effort and motivated actors.

This section now wants to give an insight to the current practice of Brownfield development in the city of Stuttgart. The analysis has shown that the municipal Brownfield management comprises policies, data and data management, funding programs and a great experience in research already exists and is a prerequisite for sustainable urban development according to the fields of remediation, revitalization, reintegration and management.

With focus on the reintegration, the economic aspect of Brownfield development, it shall be understood to which extend the initially stated policies for the improvement of administrative processes, the increase of land value, the reduction of reclamation costs and risks are already in place in order to be able to improve the marketability of contaminated Brownfield sites. Current procedures will be analyzed with respect to these policies to find bottlenecks and to introduce and implement further procedures if necessary.

6.3.1 Involved Public Authorities

In the city of Stuttgart, a total of 16 offices and departments are working together in the field of Brownfield development. Of particular note are the Office of City Planning and Urban Renewal, Building Law Office, the Civil Engineering Office, the Economic Development Department Staff, the Office of Real Estate and Housing, the Health Office and the Environmental Protection Office (INTEGRATION, 2011, p. 20). The administration of the city of Stuttgart comprises eight departments (the Mayor's area of responsibility and seven areas in responsibility of the other DeputyMayors). Departments are further subdivided into offices (e.g. Office of Urban Planning and Urban Renewal), divisions (e.g. Urban Renewal and Land Division) and sections (e.g. Funding Programs). Figure 20 gives an overview about the main departments and offices involved in Brownfield development in Stuttgart.

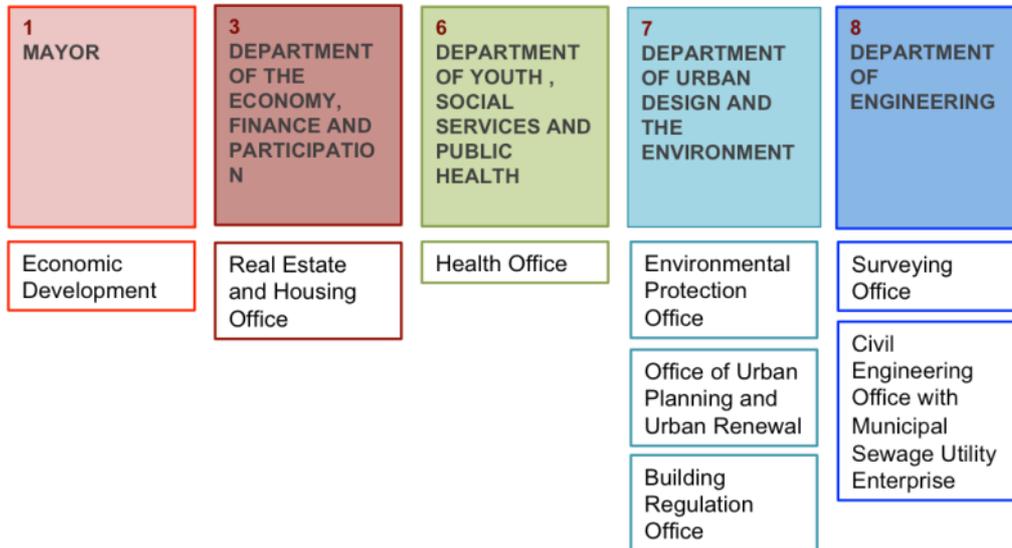


Figure 19; Municipal departments and offices involved in the process of Brownfield development in Stuttgart; Source: (LHS Stuttgart (a), 2008, p. 7), Author

Collaboration takes place at all administrative levels horizontally and vertically. Project leaders as contact persons in the different offices are installed, project proposals elaborated and experts from other offices are involved applying so called "Ämterumlauf" which means that a project proposal passes all project related offices one by one to inform about planned actions, to initiate necessary actions of the respective responsible office and to collect necessary statements and recommendations from the various perspectives with power of decision. The process is exemplarily shown in a simplified way in Figure 20. In the presented case project responsibility is settled in the office of urban planning and urban renewal.

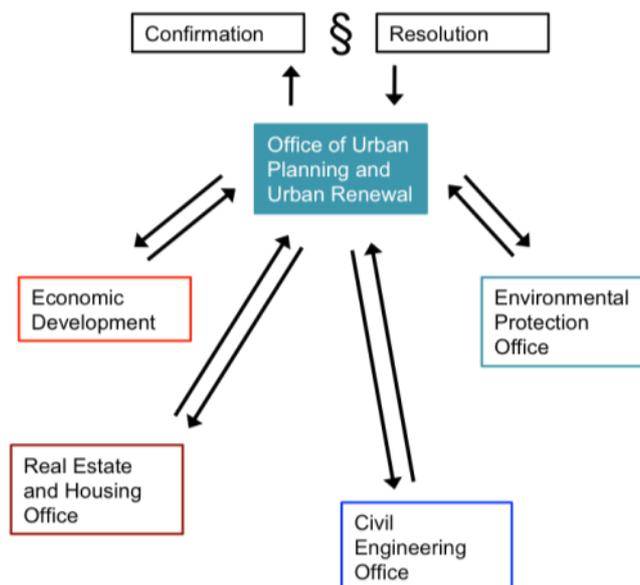


Figure 20; „Ämterumlauf“: Municipal planning procedure; Source: Interviews, Author

Planning is complex and each case is different. Some cases require alternative approaches to achieve the desired objective. This is also due to the amount of stakeholders and demands that require external expertise. The program “Social City”, settled in the office of urban planning and renewal for example uses the instrument “Interdisciplinary Project Group” to improve the communication process, to speed up and streamline the planning and implementations processes. The IPG does not have power of decision. A simplified scheme of an IPG process is shown in Figure 21.

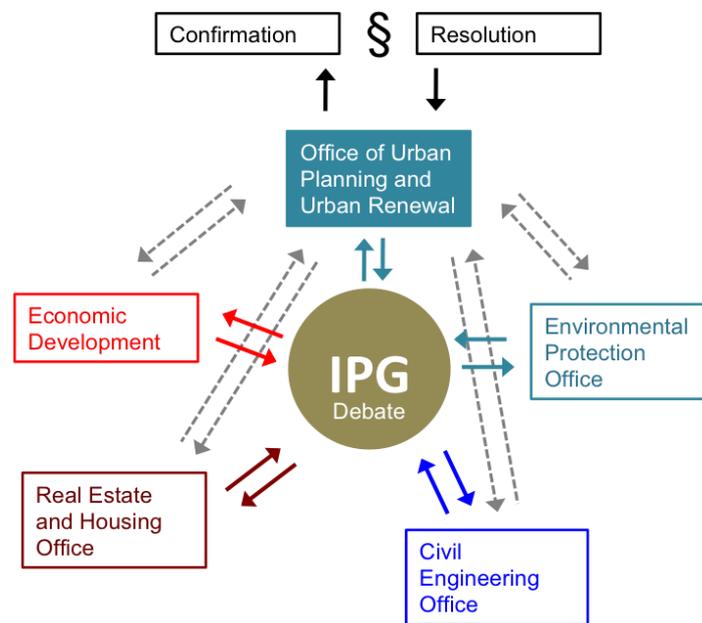


Figure 21: Collaboration process „Interdisciplinary Project Group“ IPG; Source: Interviews, Author

Economic Development

The Economic Development promotes the economic vitality in Stuttgart. It acts as a guide and stimulus for tradesmen, investors, entrepreneurs, creative people, professionals and scientists. An important function is also the assistance for start-ups as well as the establishment and relocation of companies. Thereby it acts as an active contact agency to safeguard and develop existing companies and is actively involved in the following fields of action: general consulting, safeguarding of existing specific and local business locations, business consultancy, service for the establishment of new businesses, service for start-ups, service for the creative industries and district management(LHS Stuttgart (i), 2011).

Real Estate and Housing Office

The Real Estate and Housing Office is responsible for buying, selling and management of urban properties with the exception of school buildings and some special buildings. Property and land for sale or rental is published regularly. This is to promote companies willing to settle or expanding in order to sustain and support the economic power of the city. Similarly, building lots and buildings for sale, rent or lease are advertised to promote house building and to meet the high demand for appropriate living space. The prior objective among others is to provide affordable housing to families. With the provision of land and buildings, the Real Estate and Housing Office supports all municipal offices and municipal enterprises in fulfilling their tasks(LHS Stuttgart (k), 2011).

Environmental Protection Office

The Environmental Protection Office was established on 01.01.1988 and is responsible to examine comprehensively all existing and possible environmental impacts of any municipal action. In order to safeguard all issues of sustainable development identified impacts and risks are proposed to the municipal planning and decision-making processes(LHS Stuttgart (l), 2011).

Office of Urban Planning and Renewal

The Office is responsible for all aspects of city planning, redevelopment and land division in accordance with statutory requirements and those of the municipal council. The focus of urban planning is within the four urban planning divisions: Centre, North, Neckar and Filderstadt. In collaboration with other municipal offices necessary legal preconditions for planning are created to achieve sufficient living space and workplaces and to deliver important key infrastructure, investment and office projects. The Office initiates, coordinates and advises on the preparation and implementation of rehabilitation and development measures as well as on land zoning processes. It acts as a link between participating agencies, architects, investors, funding agencies and inhabitants(LHS Stuttgart (m), 2011).

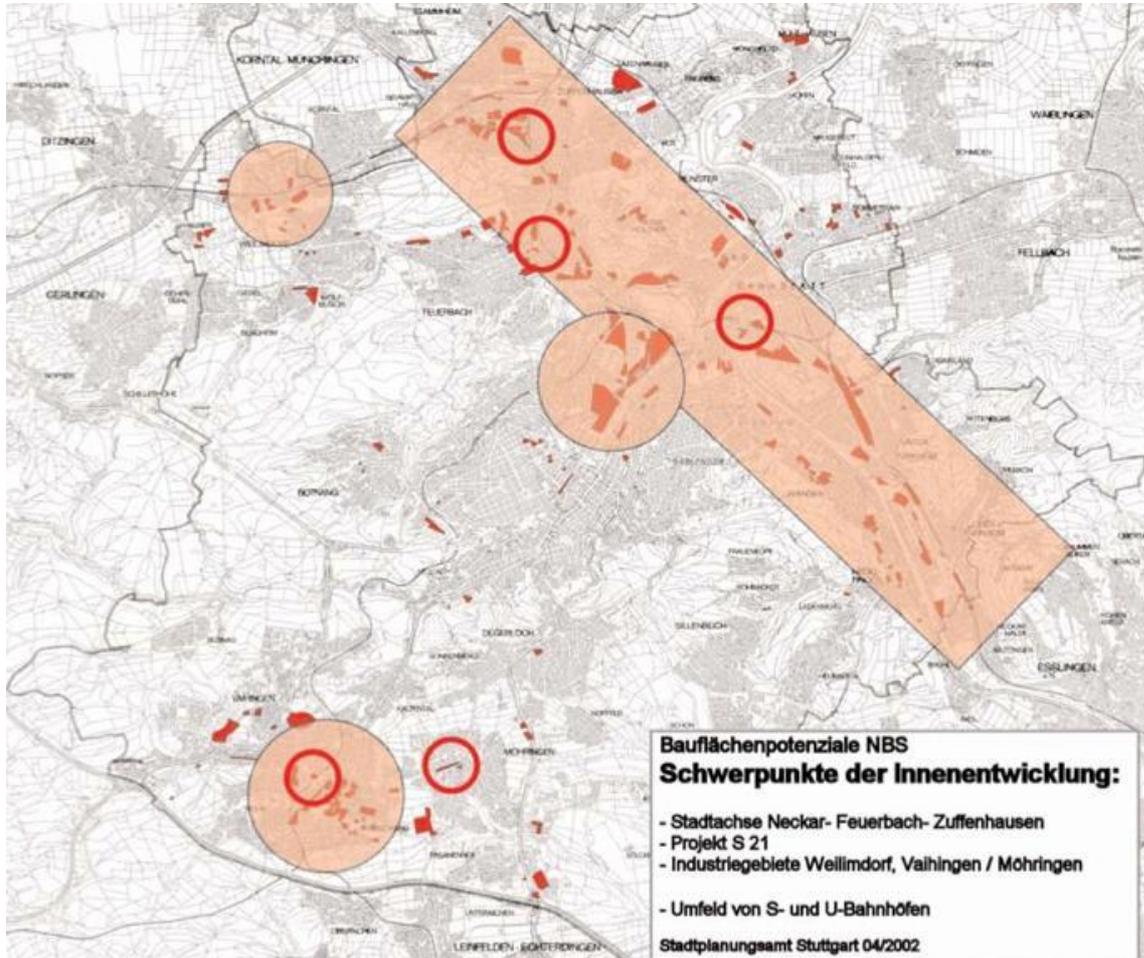
Civil Engineering Office

The Civil Engineering Office is responsible for the construction and maintenance of roads and light rail lines. It controls the traffic and ensures mobility of people in Stuttgart. In addition it builds sidewalks and bike paths. Furthermore the Civil Engineering Office creates channels and cleans the wastewater of more than 700,000 people(LHS Stuttgart (n), 2011).

6.3.2 Inner-urban Development in Stuttgart

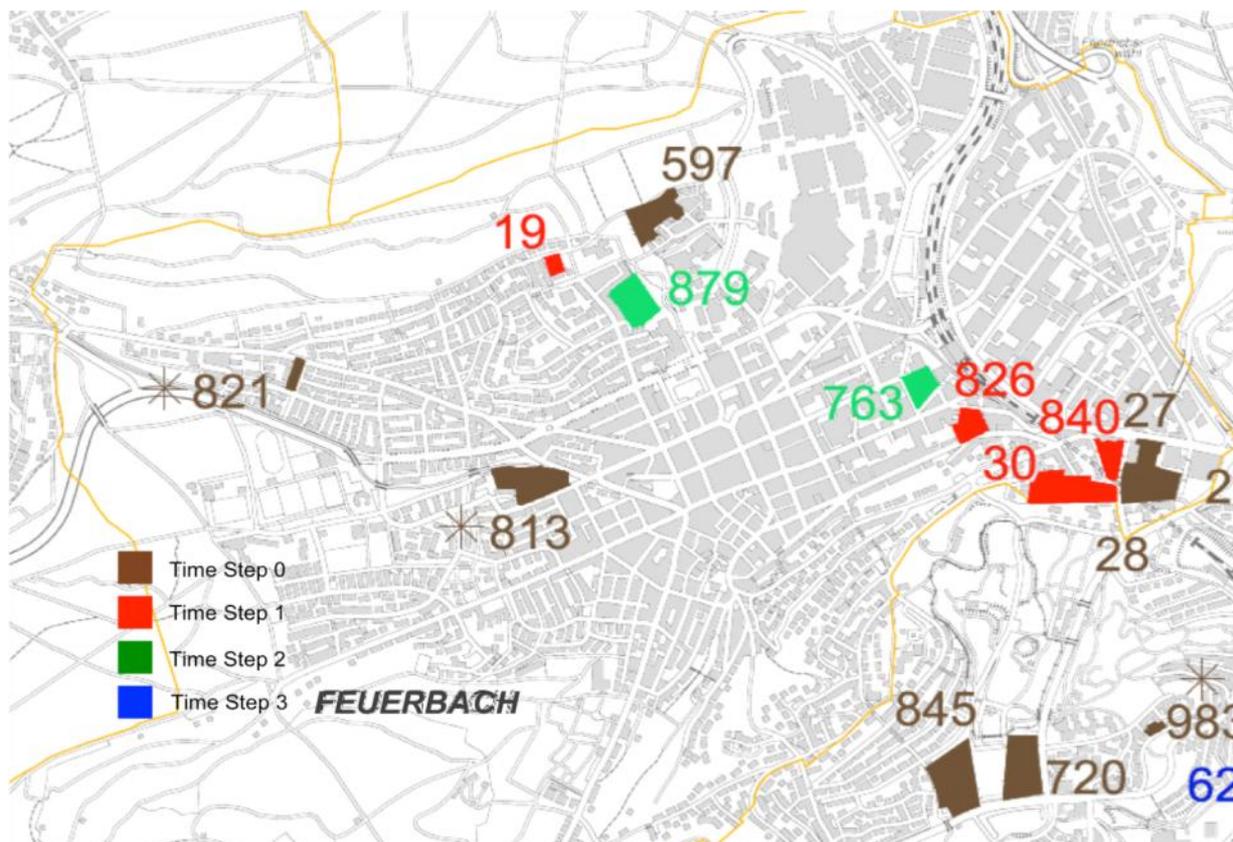
Spatial planning in Germany comprises various planning instruments that can be applied on different spatial levels to constitute the legal framework for planning. On the urban level the "National Building Code" (BauGB) provides the superior legal framework for urban development. It indicates the planning process for municipalities and contains the planning principles to limit utilization of soils and to avoid sealing of surfaces. Thereby municipalities shall be encouraged to apply specific measures like densification and Brownfield development to inner-urban development (INTEGRATION, 2011, p. 14).

In Stuttgart inner-urban development follows the mission statement of the Land Use Plan 2010 Compact-Urban-Green (see section 6.2). Development on Greenfields shall be avoided and shall take place on potential areas within the city. The basic principles for sustainable inner-urban development in Stuttgart consider the assurance of optimal urban densities, promotion of mixed uses, regard of high environmental standards and upgrading of central places and areas nearby commuter railway stations. More precisely this means to clearly entitle spatial focal points of inner-urban development in order to specify planning concepts for these focal points and to develop criteria for proper quality management (LHS Stuttgart (a), 2003, p. 116). The focal points of inner-urban development in Stuttgart are presented in Map 1).



Map 1; Core areas for inner-urban development on basis of NBS; Source: (LHS Stuttgart (a), 2003, p. 140)

In order to establish an overall development strategy for the city it is important to classify potential areas for housing and commerce according to their function and possible realization in time (LHS Stuttgart (a), 2003, p. 117). Based on the "Sustainable Management of urban areas in Stuttgart (NBS), so-called „Zeitstufenlisten“ (“time-step lists”) for both, housing and industry and commerce are used to display potential sites for development with respect to function and possible time of realization. These areas are divided into four stages in time and presented by city districts. With this list the housing market should be informed and also priorities for the development of building land may be set to meet current and projected figures for the housing stock. The list proposes a temporal sequence for the development of listed areas. The „Zeitstufenliste Wohnen“ or “time steps list housing” is the basis for implementation planning, zoning and the provision of infrastructure for designated residential areas (LHS Stuttgart (c), 2011). Map 2 shows residential development areas of Stuttgart-Feuerbach and Table 7 presents the respective “time steps”.



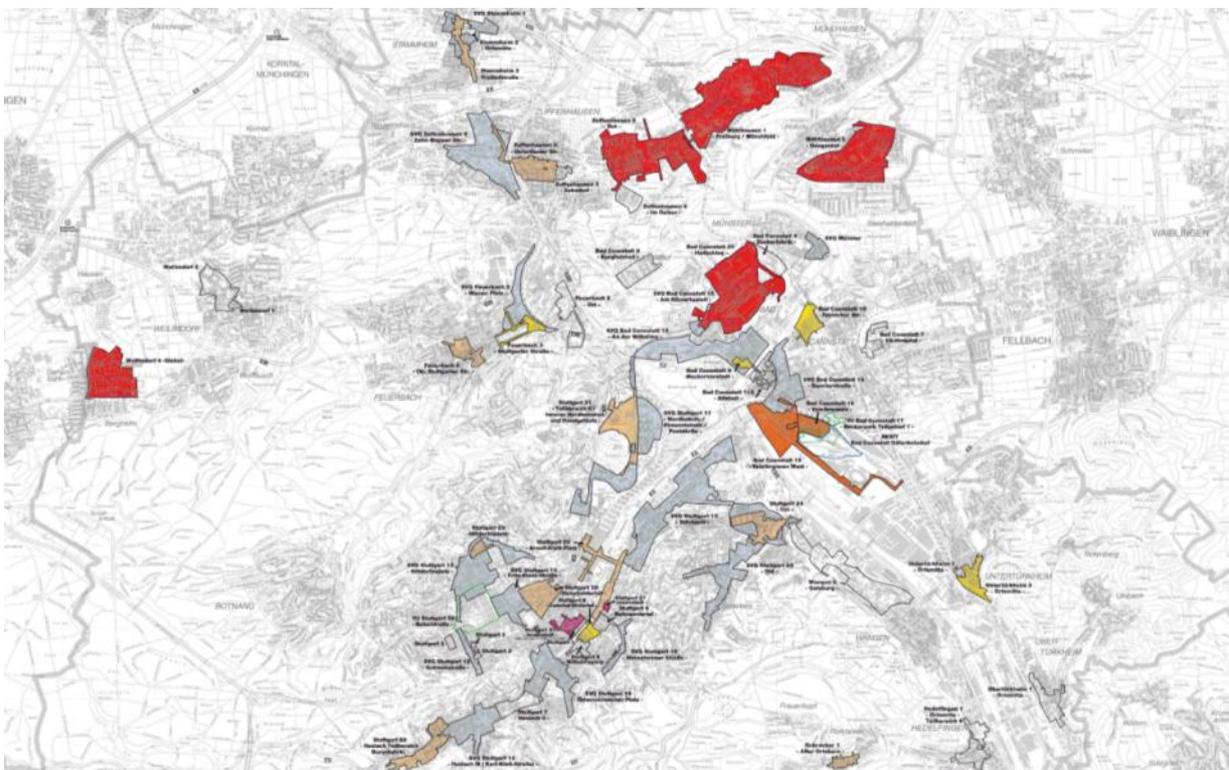
Map 2; Development areas „Zeitstufenliste Wohnen 2010“ Stuttgart – Feuerbach; Source: (LHS Stuttgart (d), 2011) Office of Urban Planning and Renewal

Ifd.Nr.	Gebietsbezeichnung	NBS-Nr.	Stadtbezirk	Fläche in ha	Realisierbare WE	Verfahrensstand	Zeitstufe
019	City-Prag	27 28 29	Feuerbach	2,75	400	R	0
020	Schelmenäcker-Ost	597	Feuerbach	1,25	40	R	0
IM BAU 021	Krankenhaus Feuerbach	813	Feuerbach	2,20	160	FNP-Änd. SB III/2010	0
IM BAU 022	Teutoburger Straße	821	Feuerbach	0,30	16	R	0
115	Hattenbühl	19	Feuerbach	0,30	10	AUF III/2010	1
116	Westliche Maybachstraße (ehem. Kabellager Post) und Rolandstraße	30	Feuerbach	2,60	200	R	1
117	Tunnel-/Gernotstraße, Oswald-Hesse-Straße (ehem. Kreppe-Areal)	826	Feuerbach	1,30	45	Auf II/2006 AUS III/2010	1
NEU 118	Maybach-Quartier	840	Feuerbach	0,80	130	R	1
220	Schoch-Areal	763	Feuerbach	1,20	120	AUF II/2010	2
221	Schelmenäcker Süd Linzer Straße	879	Feuerbach	1,70	80	Bplan erforderlich	2
Summe:				14,4	1201		

Table 7; „Zeitstufenliste Wohnen 2010“ Stuttgart – Feuerbach; Source: (LHS Stuttgart (d), 2011) Office of Urban Planning and Renewal

Urban Renewal and Urban Development are planning processes supporting inner-urban development and the revitalization of Brownfields with a possible direct municipal influence. Urban renewal measures are measures, by which an area is substantially improved or transformed to remedy urban ills (BauGB, 1999, p. 80 §136). In contrast to this urban development policies are applied to districts and other parts of the municipality, which shall be developed for the first time or shall be conducted to new development as part of urban reorganization. This is done according to their importance for the overall urban development and municipal arrangement (BauGB, 1999, p. 98 §165).

Since the early 1970s instruments for urban development and renewal like the “special urban planning legislation” (Besonderes Städtebaurecht, Chapter II, BauGB) dealing with urban rehabilitation and development measures are applied in Stuttgart. It is symptomatic for a city that the need for renewal occurs at the same time in a multitude of quarters. These quarters often differ significantly in their historic and structural conditions. This differentiated spatial "promotion situation" is part of an integrated urban development policy that has its objective to preserve good life and working conditions throughout the city and to create new ones. An important basis for establishing renewal areas in Stuttgart is the expulsion of so-called "priority areas of urban renewal" (Vorranggebiet für Stadterneuerung, SVG). Through a methodical analysis of the entire city to discover areas with need for renovation a tool has been established to support the prioritization of remedial actions. The spatial assignment of SVG has been successful since 1979, was last updated in 2005 (LHS Stuttgart (b), 2008, p. 6) and is currently being revised in 2011. According to §24 (BauGB, 1999) the municipality has a general right of pre-emption in designated urban development and renewal areas. Priority areas for urban development and renewal in Stuttgart are shown in Map 3.



Map 3; Extract of key plan showing priority areas for urban development and renewal in Stuttgart; Source: (LHS Stuttgart (b), 2008)

6.3.3 Fields of Action

The survey of potential inner-urban development areas has shown that especially elderly commercial and industrial areas have high potentials for superior uses. It has to be understood that there is a close link between the individual and the overall site area. Sound development strategies for the individual site therefore urgently have to consider the overall development tendencies of the area. Comprehensive urban planning can highly contribute to increase the development potential of individual Brownfield sites.

Beside formal and binding urban land use planning several other informal instruments are used for inner-urban development helpful for more area-oriented approaches. These informal instruments can be urban master-planning, preparatory investigation including conceptual measures, test planning and so-called future offensives. All these instruments are used to improve both, the understanding of current states and existing interrelations of macro and micro locations, planning and communication procedures (LHS Stuttgart (a), 2003, pp. 102-104).

Most of the Brownfields found in Stuttgart can be categorized as B or C-sites. Development of these categories usually requires active approaches from municipal planning authorities.

An analysis of several sites in Stuttgart indicated the obstacles for the activation of area potentials. These obstacles are summarized and related to the criteria of marketability as shown Table 8(LHS Stuttgart (a), 2003, pp. 102-106).

Obstacles for Brownfield development	Criteria of marketability
Economic boundary conditions and profitability	Reclamation Costs, Risk
Urban boundary conditions	Market Value, Management
Deficits of development	Management
Macro economic boundary conditions	Risk
Legal settings for planning	Market Value, Management
Incertitude of usage, lack of objectives for possible uses	Risk
Ownership structure, lacking willingness to sale	Management
Lacking and often insufficient not well coordinated communication	Management

Table 8; Obstacles for Brownfield Development and criteria of marketability; Source: (LHS Stuttgart (a), 2003, p. 106), Processing by the author

To mitigate obstacles for the activation of Brownfield potentials, five important fields of action could be identified, which are: Organisation, Communication/Marketing, Urban planning and renewal, Area and property management and contaminated Brownfields. These actions can be distributed among the main protagonists of Brownfield development in Stuttgart (LHS Stuttgart (a), 2003, p. 106). Their interrelations are illustrated in Figure 22.

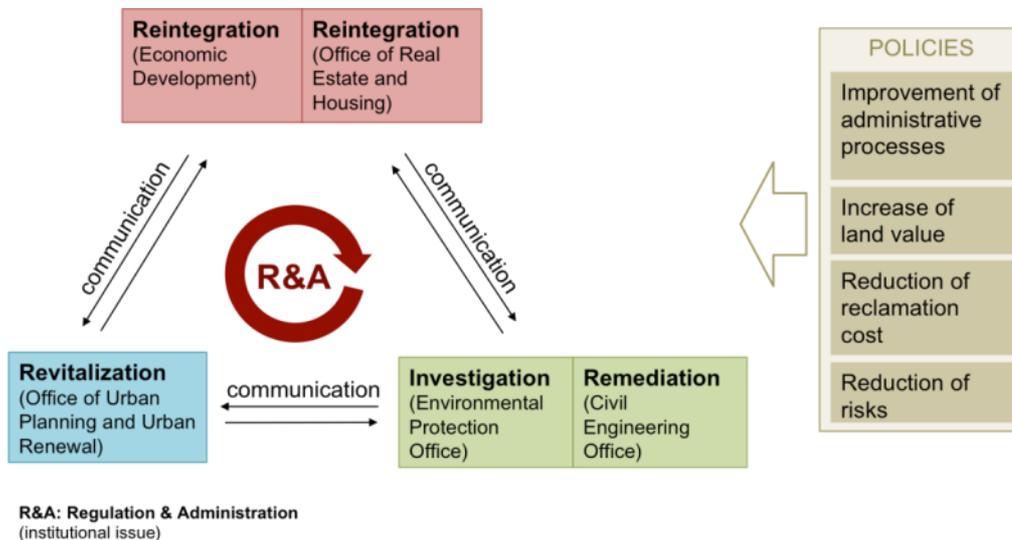


Figure 22; Brownfield development: Fields of action, protagonists, interrelations, policies; Source: Author

Inner-urban development does not just deal with contaminated Brownfield sites. However a considerable number of potential inner-urban development sites are polluted. The focus of inner-urban development lays on the mobilization of sites identified in the NBS.

According to the different fields of action the current practice of inner-urban development with focus on Brownfield development shall be identified in Stuttgart.

Organisation

In Stuttgart, responsibilities and tasks for the activation of Brownfields and their allocation are distributed among several offices within in the city administration. The main protagonists are the Economic Development, the Office of Urban Planning and Renewal, the Office of Real Estate and Housing, the Office of Environmental Protection and the Building Regulation Office. The Offices of Environmental Protection investigates municipal Brownfields, the Office of Urban Planning and Renewal works on Brownfields during urban development and renewal projects, the Civil Engineering Office remediates municipal contaminated Brownfields and the Office of Real Estate and Housing manages (among others contaminated) municipal properties (LHS Stuttgart, 2001, p. 22).

Different organisational structures are established. The “interdisciplinary NBS working group” coordinates tasks across departmental boundaries and comprises the Economic Development, the Office of Real Estate and Housing, the Environmental Protection Office, the Department of Urban Planning and Urban Renewal on the management level. The annual meeting of the “NBS Steering Group” discusses the more fundamental issues of sustainable building land management at chief officer level.

The instrument "Informal cooperative planning process" stands for an implementation-oriented planning process with direct participation of key players, the owners, management and planning experts and potential investors and project developers.

This tool is helpful for inner-urban development and renewal sites with complex issues and multiple owner structures. In such cases often just coordinated processes are able to assure sustainable and lasting

solutions. This instrument is suitable especially for land in the range of 2–5 hectares comprising several landowners and sites with large development potentials. These circumstances are very common in Stuttgart. This method is compact and relatively inexpensive and provides a useful complement to the classic competition and peer review. The following positive effects arise for the City: intensive communication between the main stakeholders increases the chances of implementation, the quality of project development can be influenced and the results are suitable as a basis for early public participation.

The complexity of inner-urban development projects demands “clear responsibilities” and active coordination of project development to guarantee sustainable solutions for these projects. This is applied for urban development and renewal projects.

For important smaller projects of inner development (e.g. Schoch-Areal) a “project coordinator” is installed within the municipality. In general, inner-urban development needs a stronger link between planning and implementation in terms of a project management (LHS Stuttgart (c), 2008, pp. 12-15).

Communication

The city of Stuttgart applies the “Sustainable inner-urban development management Stuttgart NBS” as already presented in 6.2.2. It connects the different fields of actions and therefore serves as a communicative platform. On basis of the NBS information platform, data of inner-urban development potentials is surveyed, stored, assessed, evaluated, prepared and displayed. Focal points for inner-urban development, priority areas for urban development and urban renewal as well as “Time-step-lists” for housing and industry/commerce as output maps serve as basis for transparent decision-making, providing urban planning and communication within the municipality and with private stakeholders.

Organisational forms presented before are used as project communication platforms.

Project manager, part of the Economic Development, Office of Real Estate and Housing or Office of Urban Planning and Renewal are established for internal communication with other municipal offices as well as for external communication with e.g. investors and land owners.

In special cases Area Manager are established to coordinate and manage difficult projects with multiple stakeholders, divergent interests and environmental problems (e.g. contaminated areas). Main task is conflict resolution and the simplification of communication processes (LHS Stuttgart (a), 2003, pp. 113-114).

The most common procedure of internal communication is the so-called “Ämterumlauf” already presented in 6.3.1. The respective communication process is shown in Figure 20.

Projects with high complexity demand additional communication procedures within the municipality. Therefore responsible representatives of the respective offices meet in “Interdisciplinary project groups” Figure 21. Advantages can be summarized as: immediate solution of problems and conflicts, review of different perspectives, creative and comprehensive approach of challenges.

Urban Planning and Development

The Land Use Plan 2010 rules as the current development concept for Stuttgart.

Development in existing urban areas is sustainable only if it brings also a qualitative improvement of existing neighbourhoods (“double inner development”). At the same time, development potential should be fully exploited. This means the potential urban densities are exhausted and at the same high quality standards are assured (“qualified density”).

Important quality criteria for sustainable inner-urban development projects according to Land Use Plan 2010 are: a positive balance of green-space, a positive function of climate, an environment of appropriate urban

densities, mixed uses and high environmental standards of planned buildings and the upgrade of central locations in the catchment area of commuter railway and metro stations (LHS Stuttgart (a), 2003).

For determination of development objectives not just legally binding land-use-planning but also informal instruments like master plans, preparatory investigations and respective action concepts, test planning and “future offensives” are applied (LHS Stuttgart (a), 2003, p. 102).

Strategies and focal points of inner-urban development have already been described. Maps produced among others on basis of the data stored in the NBS and basic for sustainable land management are:

- Land potentials for inner-urban development (NBS)
- Focal points for inner-urban development (NBS)
- “Zeitstufenliste housing” (NBS)
- “Zeitstufenliste industry and commerce” (NBS)
- Priority areas (SVG) for urban development and urban renewal

Land Management and Real Estate Politics

Strategic area management and real estate politics are central elements for the mobilization of unused areas for urban development. Applied sustainable and strategic land management can adequately improve land use regarding quantity, quality and location according to economic, urban, social and environmental criteria. Active proceeding is required including communicative processes with all stakeholders involved in the production of developable land, spatial and temporal priority settings for urban development, financing and quality-management. Active policies for purchase and sale of land can ensure the long-term objectives of urban development (LHS Stuttgart (a), 2003, p. 127).

Land management in Stuttgart is based upon spatial maps for inner-urban development produced by the Office of Urban Planning and Urban Renewal mentioned above. The NBS also works as a communication platform between public and private landowners and investors. The city constantly tries to purchase land for the strategic promotion of inner-urban development. Active land policies shall set the basis for successful development. The city tries in particular to positively influence development of land suitable for urban housing (LHS Stuttgart (c), 2008, p. 16)

Contaminated Brownfields

One of the main reasons hampering the development of vacant or underutilized land are existing or suspected contaminations. Especially cities with strong industrial history like Stuttgart face this challenge promoting inner-urban development. Development of Brownfields is risky. Uncertain reclamation costs that even can be higher than the current market value and other risks (see section 5.3.2) detain investments. With the purchase of land risks and liability pass to the new owner.

Survey, investigation and remediation of contaminated municipal Brownfields in Baden-Württemberg is usually funded either by the FrAl of Baden-Württemberg or in specific cases by the city's fund for Brownfields (see section 6.2.3). The majority of Brownfields in Stuttgart is privately owned. Therefore funding with the FrAl is mostly not possible. Remediation is very cost intensive. The polluter is often not available anymore, is unknown, does not have the financial means or cannot hold liable. Therefore the increase of market value of the site can be an option to compensate reclamation costs at least partly. Various parameters have influence

on the market value, among others the form and extend of possible future land uses. Housing and commercial uses increase the chances to increase the market value and therefore support Brownfield development (LHS Stuttgart (a), 2003, p. 131). To avoid urban development blockage and to support the policies for inner-urban development the city of Stuttgart distinguishes two different approaches to foster Brownfield development:

- The Investor gets financial support for investigation, development of sustainable remediation concepts and the remediation. Alternatively the city of Stuttgart takes over the reclamation costs, which exceed a prior fixed value. To reduce risks for the investor the city can be hold liable for possible future costs caused by remaining contaminations.
- The city of Stuttgart buys the contaminated land (current market value minus estimated remediation costs and Stigma). Reclamation is then operated with municipal authorities. After reclamation the land is either sold or used for public buildings.

6.3.4 Processing of Brownfields

Dealing with inner urban development it is very common to get in contact with Brownfields. Brownfields bigger than 2000m² potential additional floor space are displayed in the inner-urban development maps actively processed as shown before.

Brownfields smaller than 2000m² potential additional floor space are not considered in these maps and therefore not actively processed. Different public authorities are directly confronted with contaminated sites in different ways. The process for necessary Brownfield remediation, revitalization and reintegration of smaller sites, not displayed in the "Time step lists" is initiated at different administrative competences. Recognition of the task and the perspective for handling are different and as a result also further actions undertaken. According to the main municipal protagonists active in fields of emerging contaminated Brownfields and their handling, three different paths can be distinguished: Path 1 with the protagonist „Office of Urban Planning and Urban Renewal“, Path 2 with the protagonist „Office of Real Estate and Housing“ and Path 3 with the protagonist „Environmental Protection Office“.Figure 23 displays the different levels of Brownfield processing in Stuttgart.

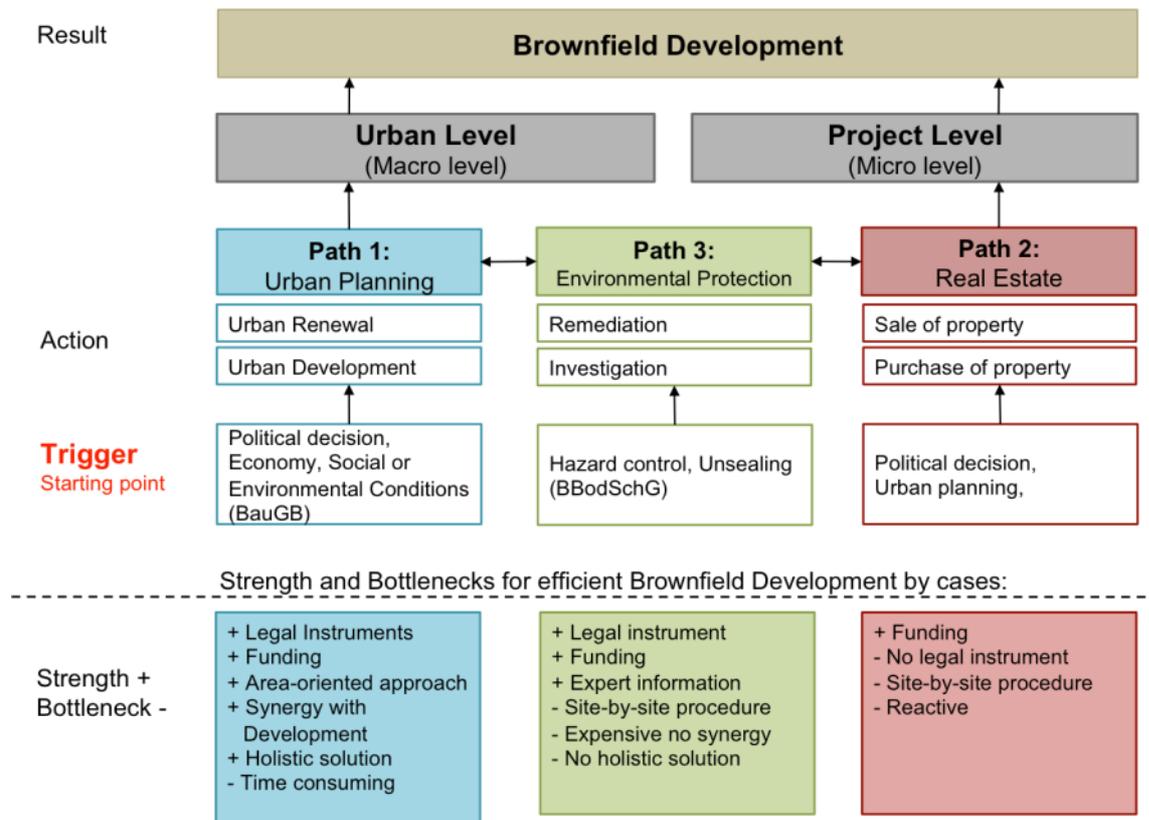


Figure 23; Categorization of initiatives for the treatment of municipal Brownfields; Source: Author

In the cases presented, the authorities are directly confronted with the need for Brownfield treatment, the technical implementation and financing. Practical solutions have to be found even though approaches differ between the shown cases.

Path 1: Urban Development and Renewal

In course of an urban development or renewal procedure urban deficits are examined. Vacant or underutilized sites within the renewal area are observed. Small existing contaminated Brownfields are recognized either due to already existing plans or during investigation. These polluted Brownfields can either be private or public property. Under coordination of the project manager for the respective designated renewal area these sites can be rehabilitated. Public funding according to the law for urban development or renewal areas can be awarded. In this case site-by-site procedures or even area-oriented procedures are applied like in example “Renewal Area Feuerbach 6”.

Path 2: Real Estate

Two cases are to be distinguished: On recommendation of the Office of Urban Planning and Renewal or the Office of Environmental Protection land shall be purchased. In the course of purchase negotiations existing contaminations are investigated. In case of purchase contaminations have to be treated or cleaned up under direction of the Office of Real Estate and housing.

The same is true for the case of property sale. Municipal property shall be sold but due to existing or suspected contaminations or existing treatment measures like Pump&Treat no interested party can be found. Therefore the site has to be cleaned up in order to increase the marketability of the property. Funding for investigation and remediation of municipal properties is available. In these cases a site-by-site procedure is applied like in example "Stuttgarter Strasse 10".

Path 3: Environmental Protection

During surveys carried out by the Office of Environmental Protection to update the Brownfield cadastre severe contaminations are detected, which directly could be harmful to human health or the environment and therefore treatment is necessary. These sites are mainly of private property. Under the direction of the office of environmental protection the contaminations are further investigated and treatment or remediation is implemented. Funding for investigation and treatment of private property is not available. In this case site-by-site procedures are applied.

For severe cases the property has to be bought by the public to ensure the treatment and to mitigate environmental risks. Then the case proceeds according to Path 2 like in example "Schoch Areal".

Huge municipal Brownfield areas have considerable impacts on urban environment and are therefore in the focus of the public and processed at the urban level. The macro perspective is considered. Small municipal contaminated sites without any influence on the urban environment are not in the attention of the public and therefore usually treated just on the micro level using a site-by-site procedure. Self-contained reintegration is difficult due to low marketability, which results in high costs for the public.

According to the topic of this research work the marketability of contaminated Brownfields is of main interest. Criteria of marketability influencing the reintegration of rehabilitated sites into the economic market cycle have to be considered at any point in the development process.

6.3.5 Interim Summary Brownfield Processing

In Stuttgart inner-urban development is strongly supported by policies, data and data management tools, research activities and pilot projects. On all levels routine procedures are established and also innovative management methods are applied for specific cases. Promotion programs are available on all levels mainly involved in the process of inner-urban development.

There are also some bottlenecks, which influence efficient implementation of inner-urban development policies. Money available for the funding of Brownfield investigation and remediation on the federal level is decreasing. Expert knowledge is spread among departments and offices. The routine communication procedure "Ämterumlauf" is time consuming, complicates communication and mainly considers just case-by-case handling. This also fosters the separation of theory and practice as planning and execution offices often have diverse perspectives. For small Brownfield projects competences are distributed among offices, which also complicates coordination of available funding.

The shown cases demonstrate that contaminations and the need for remediation is not integrated actively in the urban planning process. Induced treatment of contaminations and Brownfield development on urban level partly considers area-oriented approaches for Brownfield development e.g. during urban development or urban renewal activities. On the project level just site-by-site procedures are applied.



III STRATEGY FOR BROWNFIELD DEVELOPMENT INSTUTT GART

"Only when we settle at the right place and with proper densities, we can use saving systems. [...] Effective environmental protection is always done here and now."(Speer, 2010)

The city of Stuttgart has already a rich tradition in inner-urban planning and Brownfield development. The analysis undertaken has shown that routine procedures for sustainable inner-urban development are supported with laws and policies, comprehensive up-to-date data and management tools, funding programs and expert knowledge. Participation in research and pilot projects opened up the opportunity for continuously improvements in various fields and on different levels, starting with the application of innovative investigation procedures for complex contaminations up to modern management approaches for complex development projects. Funding is available for remediation, revitalization and reintegration. But it has to be considered that financial promotion for Brownfield investigation and remediation decreased. Further on the analysis has identified bottlenecks in the recognition and processing of small Brownfield sites. Small Brownfield sites (< 2000m² potential additional floor space) are very common in Stuttgart. This is of interest due to often existing severe contaminations. High reclamation costs go along with low market value, which impedes private investments. These sites, classified as C-sites, just can be rehabilitated with public engagement. Against the backdrop of reduced funding, the existence of high amounts of small often contaminated Brownfields in Stuttgart and the policy inner-urban development first, small Brownfields have to be given more importance and new development approaches have to be applied. The project CityChlor has its focus especially on small, contaminated Brownfields. Measures provided by CityChlor to tackle the challenges mentioned above will be presented in this part of the research and applied on a Pilot Site in Stuttgart-Feuerbach.

7 CityChlor Approach for Brownfield Development in Stuttgart

CityChlor has identified the bottlenecks often impeding Brownfield development. They can be found on all project levels starting from politics, planning and management up to the project implementation. Complexity must be answered with holistic approaches. Therefore CityChlor promotes the application of the Integrated and Area-oriented Approach to tackle all existing components contributing to sustainable development of small, contaminated Brownfields. Both, the Integrated Approach and the Area-oriented Approach and their possible integration into existing municipal administration shall be presented in this chapter.

7.1 Scope

„If the perceived value of a site is less than anticipated costs, the site will remain vacant or under-used for the foreseeable future (Category B and C sites). This can only change if there is some means of creating a surplus of value over cost“ (CABERNET, 2006, p. 55).

Surplus can be achieved therefore either by increasing the market value, by reducing anticipated costs or a combination of both. According to (CABERNET, 2006, p. 55) just little changes of perceived costs and values are necessary to bring B-sites back to the market, whereas C-sites require a more active role of public authorities. As possibilities for funding are limited either by existing financial means or legal requirements the cities have to examine other solutions to support and ensure development. This is especially true if contaminations have to be treated due to existing harming environmental influences. The need for remediation can therefore lead to initiatives for Brownfield development and could even influence urban development procedures.

It is needless to say that the economic aspect is a key issue to activate investments from the private sector for Brownfield development. “Without a viable use of land, site remediation by itself does little for local regeneration.”(CABERNET, 2006, p. 56) The objective therefore should be to increase the marketability of the polluted Brownfield site. Adequate policies could be: Increase of market value, reduction of reclamation cost, reduction of risks and improvement of related project administration. Both, the public and the private sector can actively contribute to reach the objective. Public Private Partnership benefits from the fact that each party contributes what it does best.

This research work focuses on actions driven by the municipality to achieve sustainable reintegration of small, contaminated Brownfield sites. Sustainable reintegration considers on the one hand development policies set by the Land Use Plan 2010 and the Urban Development Concept (STEK) like among others: well integrated developed sites, qualified densities (adequate densities and architectural quality), mixed uses, green connected areas, balance of climatic functions, development prior nearby commuter railway stations and remediation of contaminants harmful for the environment. On the other hand the project has to be economically viable. Special characteristics on the site and on the micro level as well as the demanded use have to be considered.

Proposed measures to be examined are the Integrated Approach and the Area-oriented Approach, on urban and project level. While the urban level considers municipal administration on the city scale the project level focuses on measures affecting the site and its environment on the micro level.

7.2 Integrated Approach

According to (City Chlor (e), 2011) the Integrated Approach “combines all aspects that are relevant to tackle the problems that VOC in urban environment causes.“ It comprises socio-economical aspects, technical, temporal, spatial, environmental, contextual aspects and the involved actors and stakeholders. Characteristics of the site influence the focal points and the aspects to be considered.

This paper investigates the economic aspects of the Integrated Approach and Area-oriented Approach. As already shown the economic aspect cannot be seen separately but is linking all other aspects important for sustainable Brownfield development. The application of the Integrated Approach therefore shall contribute to achieve a good solution for area and site, a healthy environment, a city worth living in and happy citizens (Kirchholtes, 2010). Hereby should be clarified:

1. How the need for Inner-Urban Development can help to clear and clean contaminated Brownfield sites in order to reintegrate these sites into the economic market cycle?
2. How the need for remediation of contaminated sites can influence the procedure of Urban Planning and Urban Development?
3. How economical burdens of Brownfield development due to the need for remediation of poisonous waste can be minimized and transferred from the public to the private market?

Sustainable urban planning in general and urban development in particular needs to apply the Integrated Approach to tackle economic, social and environmental issues. Brownfield development requires the integration of planning, remediation and reuse and all its related aspects, which are among others socio-economic, technical, environmental and institutional aspects. It can also be expressed with the actions of sustainable Brownfield development, which have already been presented in chapter 5.2. In other words the actions of remediation, revitalization and reintegration have to be integrated into the process of urban planning and development. (CABERNET, 2006, p. 85)

Even more the reality of severe contaminations of small Brownfield sites (mostly C-sites), with high reclamation costs and low market value has to be considered actively on the higher urban planning level. Figure 24 illustrates the application of integrated and area-oriented procedures and the interdependence of urban planning and contaminated Brownfield.



Figure 24; Integrated urban planning; Source: Author

7.2.1 Levels of Integration

Chlorinated hydrocarbons (CHC) can cause severe contaminations. Due to their physiochemical properties CHC pollute soil, air and groundwater. The remediation of areas contaminated with CHC is a challenging, lasting and expensive task. Therefore a holistic approach for remediation is required to tackle the existing problem. The relevant aspects include socio-economic aspects (this paper just considers the economic aspects), urban planning and development, environmental engineering and management (von Schnakenburg, Peter (a), 2010). The Integrated Approach has to be applied on the urban level or macro level as well as on the project level, which comprises the micro level and the site.

Integration on urban level ensures the consideration of all Brownfield sites in the urban planning and development process and the creation of development strategies on the project level. Integration on the project level ensures investigation of polluted groundwater plumes on the micro scale and the development of remediation strategies for all exposure pathways on the site. Integration on the project level further on considers the creation of concepts for the integration of remediation into the revitalization and development process of the site (von Schnakenburg, Peter (a), 2010).

The economic aspects are considered on the urban and on the project level. The integrated approach distinguishes various levels and actions of integration shown in Table 9.

	Urban level (Macro level)	Project level	
		(Micro level)	Site
Urban planning and urban development (Revitalization)	Consideration of all polluted Brownfield sites for inner-urban development, Specific site-related development strategy for the micro level	Development concept for polluted Brownfield site, Remediation concept integrated into the construction process	
Environmental engineering (Remediation)	Survey of polluted Brownfields, Categorization (criteria: contamination, possible uses, cost estimates), Prioritisation	Investigation of soil, groundwater and indoor air pollution and its sources	Remediation of all exposure pathways (Wirkungspfade)
Organisation and communication (Management)	Initiation of Brownfield development procedure	Communication and coordination of Brownfield development	
Economic aspects (Reintegration)	Improvement of administrative processes (interdisciplinary project groups, project manager, area manager), Increase of market value (environmental upgrade around polluted Brownfield site on micro level), Reduction of risks (coordinated, streamlined, transparent administrative processes)	Increase of Market Value (Area-oriented approach), Reduction of risks (increased marketability)	Reduction of reclamation costs (integrated remediation and construction process, hot spot remediation), Reduction of risks (holistic investigation of contaminants)

Table 9; Levels of Integration; Source: Author

The challenges of the Integrated Approach can be summarized as follows:

- Horizontal dimension (management: organisation communication, planning)
- Vertical dimension (time: consideration of development trends)

The existence of contaminations should be considered for the selection of urban development sites. Contaminated sites must be ranked according to risk considering contaminants and affected exposure pathways.

7.2.2 Area-oriented Approach

The Area-oriented approach is complementing the Integrated Approach on both, the urban and the project level. It is applied in the field of urban planning and environmental engineering.

The Area-oriented approach focuses on the remediation of large urban areas instead of case-by-case and site-by-site procedures. According to (City Chlor (e), 2011) it is a “technical approach which makes it possible to remediate, monitor and control multiple groundwater sources and plumes within a fixed area”, whereas the “area can be to extend the border around the plumes; area can be location based;” and “area can be in a city, Brownfield or even natural area (i.e. former landfill)”.

The benefit of the Area-oriented approach is to come up with a comprehensive understanding of a polluted area. Hot spots therefore can be localized and remediation effort and financial means can be directed to the most severe polluting sources. As a result the risk for further contamination of a remediated site due to still existing contaminants on neighbouring plots can be highly minimized.

The Area-oriented approach can also be applied in the field of urban planning and development on urban and project level.

Reclamation cost of small and highly contaminated Brownfield sites often exceed the market value. One criterion influencing the market value is the plot size. Development of larger areas is usually more profitable. Costs can be spread over larger areas. Reclamation costs per m² building land, per m² floor space or per m² overall development costs therefore in general decrease with increasing plot size assuming that no additional remediation costs occur. The Area-oriented approach on the project level focuses on the extension of connected developable land. The need for remediation applying the Area-oriented approach therefore can stimulate urban development processes (Bottom up). Integrated planning, considering small and contaminated sites as part of urban development areas and applying the Area-oriented approach on the urban level then can actively contribute to Brownfield development on the project level (Top down). The Area-oriented approach should be applied therefore on both, the urban and the project level. Property structure in inner-urban location is usually not easy. The implementation of the Area-oriented approach on the project level therefore requires active coordination on urban level at an early stage as part of integrated provident urban planning. A SWOT analysis and test planning might be adequate instruments for the understanding of possible area extensions and potentials to attract investors.

The Area-oriented approach, embedded in urban renewal and redevelopment activities can be a helpful measure to influence and increase the market value and also to reduce the absolute reclamation costs for small and contaminated Brownfield sites. The Area-oriented approach distinguishes various levels and actions of integration shown in Table 10.



	Urban level (Macro level)	Project level	
		(Micro level)	Site
Urban planning and urban development (Revitalization)	Area-oriented specific site-related development strategy for the micro level	Area-oriented development concept for the polluted Brownfield site	
Environmental engineering (Remediation)		Area-oriented investigation of soil, groundwater and indoor air pollution and its sources Area-oriented remediation of Hot Spots considering all exposure pathways	
Organisation and communication (Management)	Area-oriented initiation of Brownfield development procedure, eventually purchase of neighbouring properties	Area-oriented communication and coordination of Brownfield development	
Economic aspects (Reintegration)	Improvement of administrative processes (Interdisciplinary project groups, project manager, area manager), Increase of market value (environmental upgrade around polluted Brownfield site on micro level), Reduction of risks (coordinated, streamlined, transparent administrative processes)	Increase of Market Value (Area-oriented approach), Reduction of risks (increased marketability)	Reduction of reclamation costs (integrated remediation and construction process, hot spot remediation), Reduction of risks (holistic investigation of contaminants)

Table 10; Levels of Area-oriented approach; Source: Author

7.2.3 Data Management and Appraisal

As shown in chapter 6, inner-urban development and the associated Brownfield development in Stuttgart is strongly supported by laws and policies and can fall back on comprehensive data sets. Data is assessed, evaluated, prioritized and the produced maps serve as a basis for communication and decision-making for inner-urban development. Small, contaminated Brownfields with less than 2000m² potential additional floor space are not adequately considered and their processing mainly just takes place in a site-by-site procedure. Data for these areas is available in the „Vacant lot“ cadastre already integrated in the municipal data management system SIAS.

How and where the actions of Integrated approach can be implemented into the existing management and planning procedure for inner-urban development in Stuttgart?

Data management has a core role in the process of integrated planning and is settled on the urban level. Relevant data for inner-urban development with integrated information about all contaminated Brownfields is overlaid. Priority areas for inner-urban development as well as sites already in public property are considered Figure 25. In Stuttgart the municipal data management system SIAS can be applied.

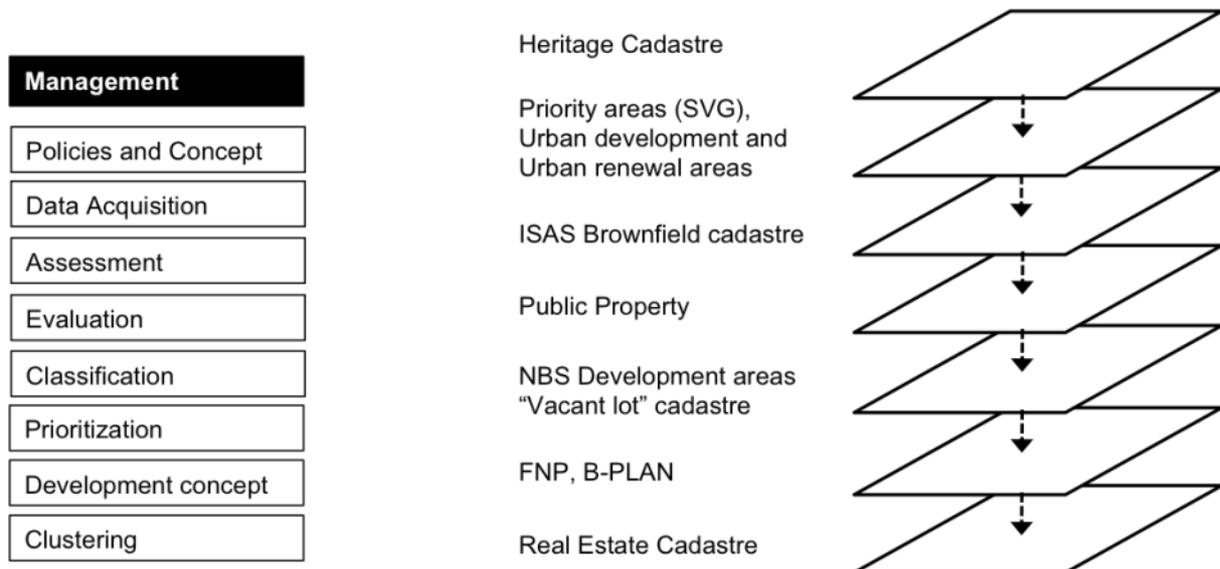


Figure 25; Data organization and overlay according to the integrated management process; Source: Author

7.2.4 Application Process

The municipal data management system SIAS can serve as a perfect platform for integrated urban planning applying the Area-oriented approach. Required data is already available and now has to be applied adequately. Conclusions for the final project case can be drawn first of all on the macro level through the Office of Urban Planning and Urban Renewal with contribution of the Economic Development and Office of Real Estate and Housing with its division Real Estate Transactions representing the economic perspective as well as the Office of Environmental Protection with its division Municipal Brownfields dealing with areas of suspected contaminations and the Civil Engineering Office representing the environmental and technical perspective of remediation. See also Figure 22 in section 6.3.3.

Integrated urban planning with area-oriented approach – urban level

The following sequence (Figure 26 - Figure 29) presents in an abstract and very simplified way one possible procedure of integrated urban planning applying the Area-oriented Approach on urban level.

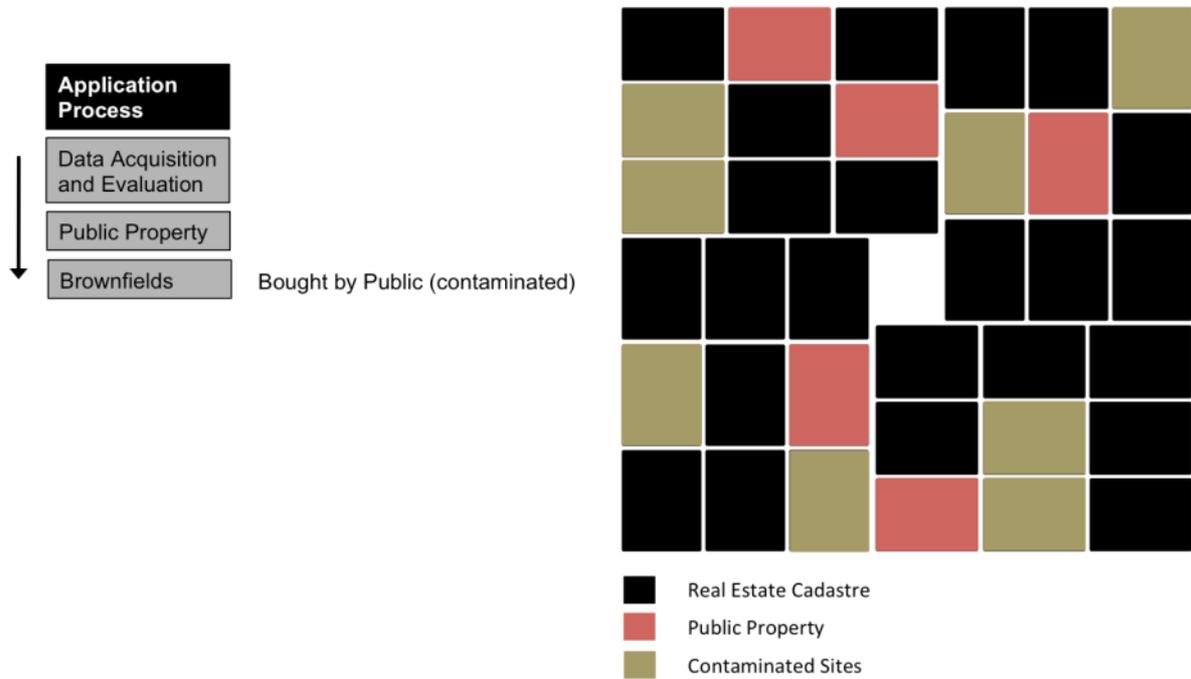


Figure 26; Data overlay public property and polluted Brownfields; Source: Author

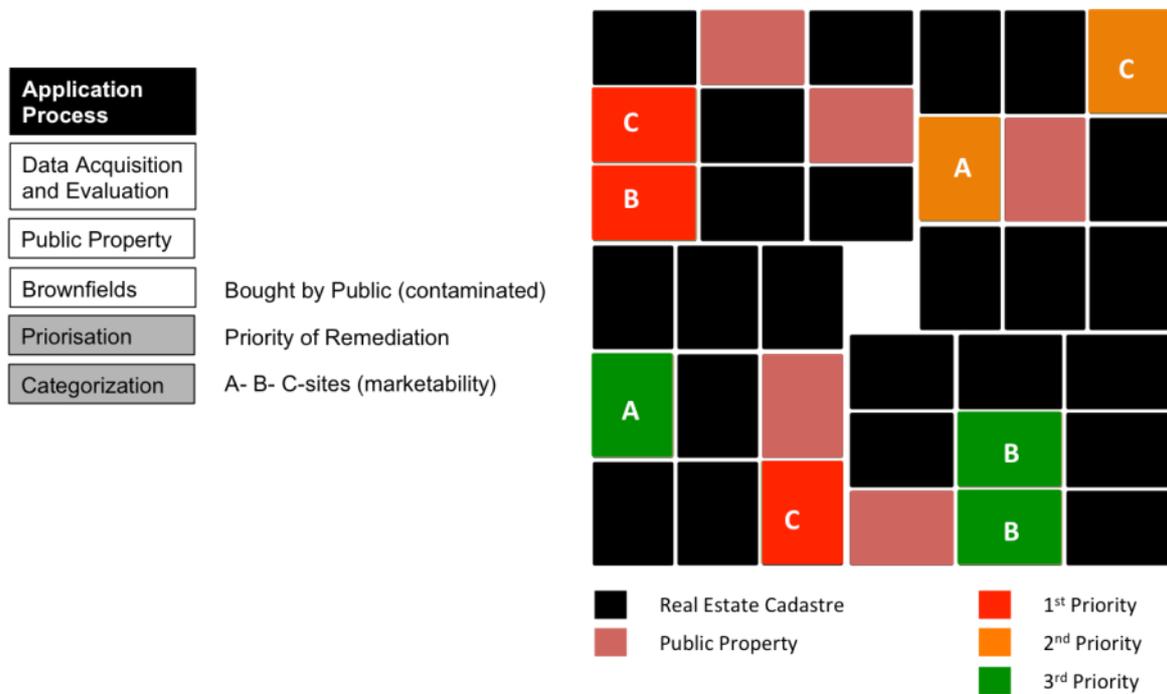


Figure 27; Prioritisation and Categorization of polluted Brownfields; Source: Author

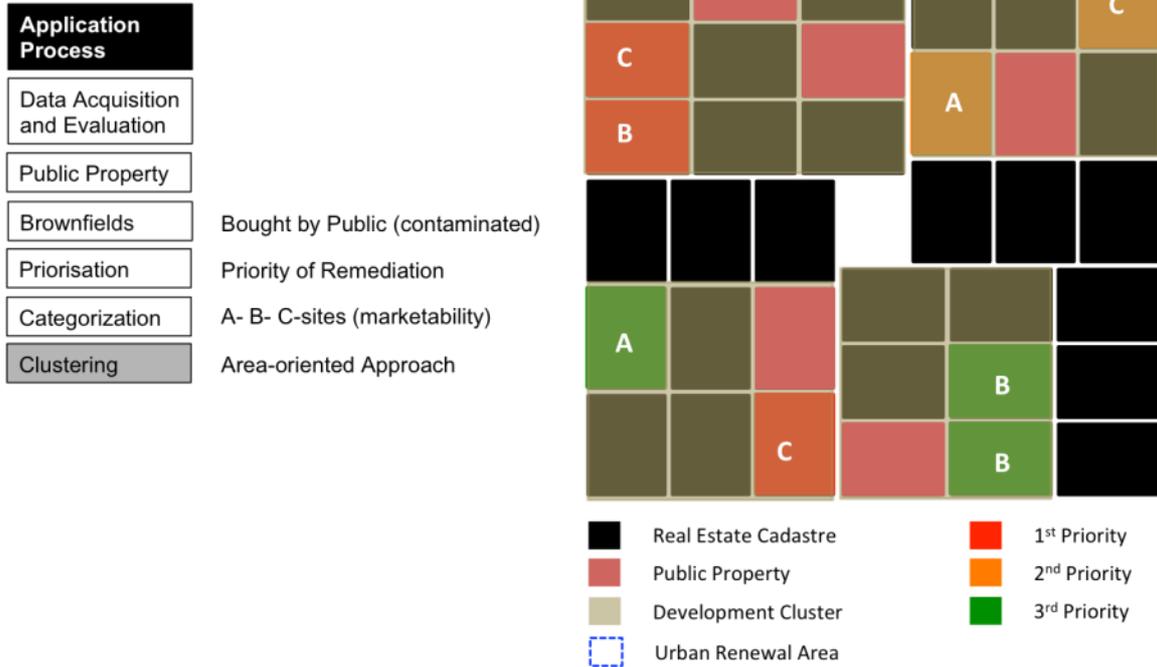


Figure 28; Application of Area-oriented Approach; Source: Author

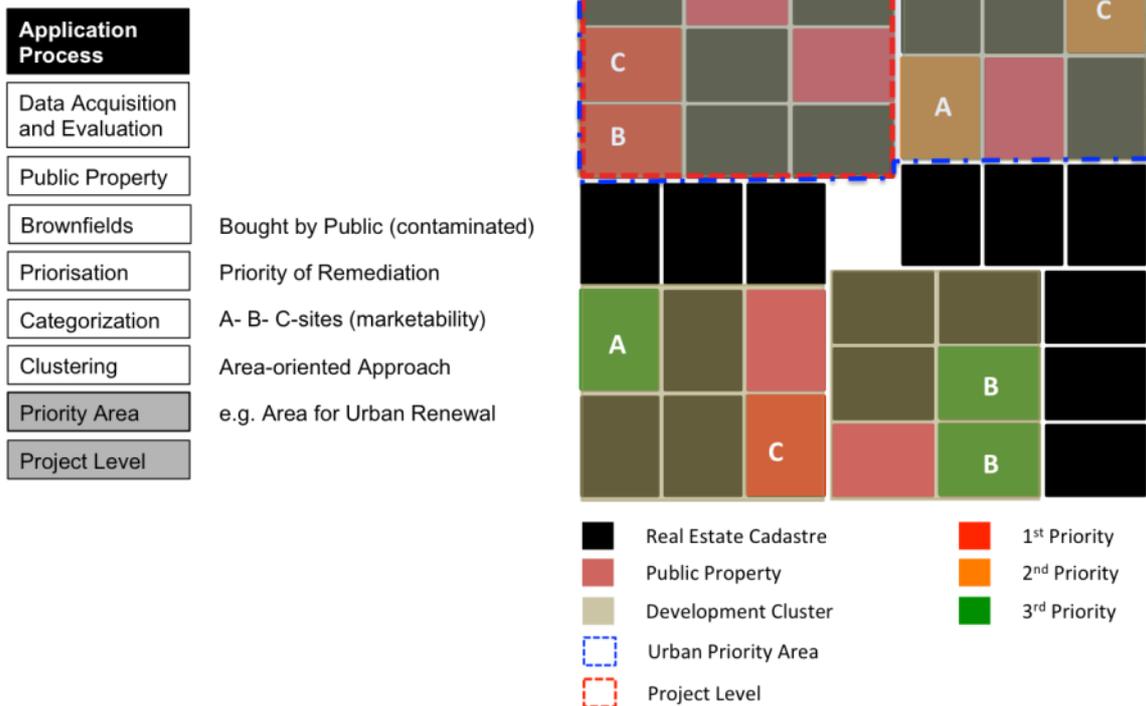


Figure 29; Designation of Priority Areas and definition of development area on Project Level; Source: Author

Area-oriented Approach - Project level

The Application of the Area-oriented Approach on the Project Level is demanding due to diverse, often private land-owners. Therefore the process has to be carefully planned. Two different procedures are possible:

1. The municipality buys the needed plots (e.g. within an urban renewal area)
2. An investor buys the needed plots under public coordination

The following sequence shown in Figure 30 presents in an abstract and very simplified way one possible procedure of an Area-oriented Approach on project level.

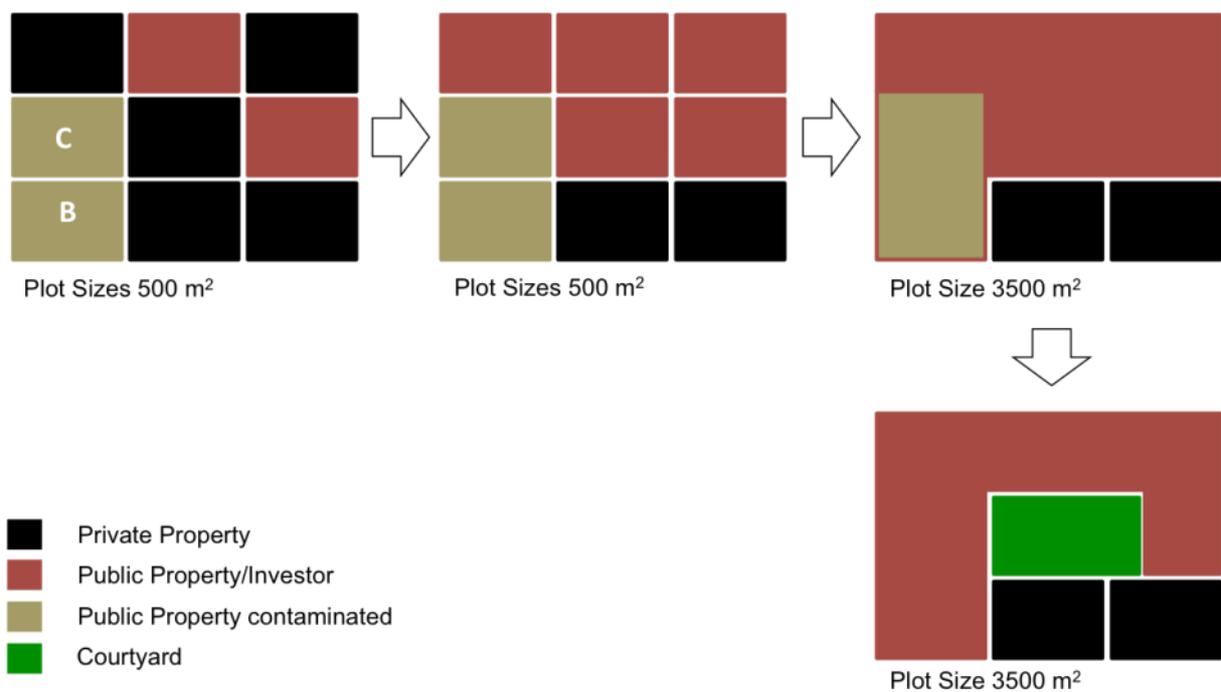


Figure 30; Area-oriented Approach on project level; Source: Author

7.3 Management Process

The Area-oriented Approach must be preceded by a strategy and concept phase, which defines the goal and the path. A clear roadmap for example a development plan with an integrated remediation concept, carried out to make the development process more transparent can be helpful for both, the public and investors.

The Integral remediation plan aims to optimize the existing instrument “redevelopment plan” pursuant to § 13 of the Federal Soil Protection Act, which is mainly applied if polluted Brownfield sites have to be considered in the course of inner-urban development. Large-scale integrated recovery plans act as an acceleration tool by bundling and improved coordination of legal, technical and organizational requirements of area redevelopment measures. It contains the textual and graphic representation of the planned remediation measures and demonstrates their suitability. The “redevelopment plan” can be set to be binding. This can significantly contribute to the creation of legal and planning security for participating investors or developers. The costs associated with land development risks become calculable and a significant barrier for investments is eliminated (REFINA, 2011, p. 106). An exemplary management process is shown in Figure 31.

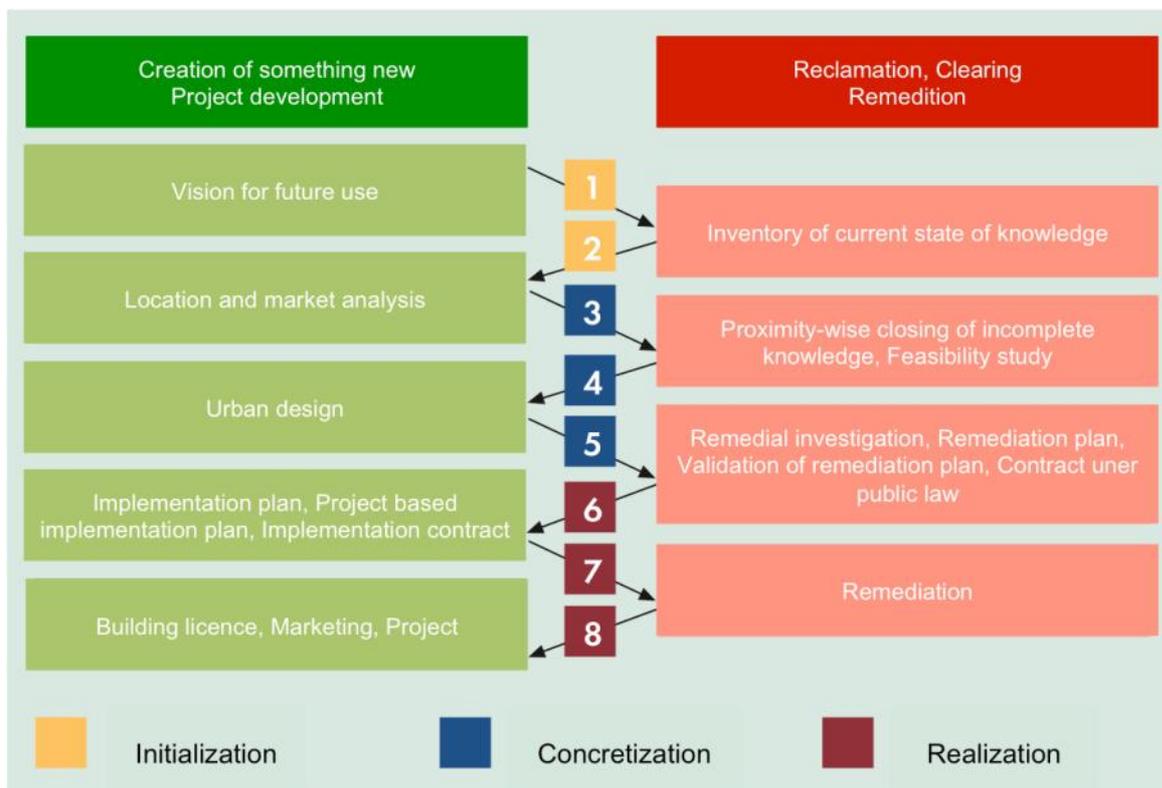


Figure 31; Reciprocal effects on polluted Brownfields sites in the process of land recycling; Source:(REFINA, 2011, p. 106), Translation by the author

8 Case Study Area and Pilot Site

The proposed measures to achieve sustainable reintegration of contaminated Brownfields presented in the previous chapter shall now be applied on a Pilot Site in Stuttgart-Feuerbach. The case study area and the Pilot Site are presented to draw a background images for the environmental framework conditions in which the measures are going to be implemented.

8.1 Why Stuttgarter Straße 10

The site Stuttgarter Straße 10, located in Stuttgart - Feuerbach was chosen as a Pilot Site for the EU research project CityChlor. Supposed measures of CityChlor shall be exemplarily applied at this site. The decision for Stuttgarter Straße 10 as Pilot Site was made according to the boundary conditions set by the project as well as practical considerations. As the site is in public property there is on the one hand unrestricted access to the site, which simplifies handling and on the other hand the public is forced by law to clean up or even treat the contaminations.

Pilot Site Boundary Conditions

- CHC contaminated
- Highly polluted soil and groundwater
- Inner-urban site densely built up
- Small site
- Polluter known but cannot hold liable
- Public property
- Difficult geology
- Source zones partly beneath existing building

Table 11; Boundary conditions; Source: (City Chlor (b), 2011), Author

The property Stuttgarter Straße 10 shows a variety of features, which usually hamper Brownfield development. The application of the Integrated and Area-oriented Approach seems to be an adequate procedure to tackle the presented challenges. It shall be shown how and what actions are required to reach the objective of sustainable development of Stuttgarter Straße 10 with focus on the economic aspect influencing its reintegration into the market cycle. An analysis on all influencing planning levels, the urban level (macro level) and on the project level (micro level and site) will be carried out. This survey is prerequisite for the assessment of the site to come up with the strength and weaknesses as well as opportunities and threats that have to be considered for sound development and actions to be conducted. The Pilot Site will further on be named S10.

8.2 The Case Study Area Stuttgart – Feuerbach: Urban Level

Analysis on the Urban Level comprises available data and administration as well as the current status and predicted development of Stuttgart and its district Feuerbach.

8.2.1 Historical Development and current Situation

The case study area is located in Feuerbach one of the 23 urban districts of Stuttgart. As the topic of Brownfield Development is closely related to the younger history of Feuerbach starting in 1849 a historical introduction to the district shall draw the background for an understanding of the current situation and the challenges Feuerbach is facing today.

Feuerbach first mentioned in 1075 as Biberbach is located in the north of the basin of Stuttgart called Killesberg in the valley of the river Feuerbach. Just since 1575 the name Feuerbach is documented. The settlement stayed rural up to the industrialization and was determined by agriculture, viniculture and cattle breeding. Industrialization in Feuerbach started with the construction of the railroad in 1846. Until 1900 already 45 companies settled in Feuerbach, mainly from the chemical, leather, paper, metal, textiles and foodstuffs industries (e.g. Kast & Ehinger / BASF, Werner and Pfleiderer, Robert Bosch GmbH). Besides the commercial and industrial areas numerous housing estates for the workers were developed. Feuerbach became a prosperous industrial city with already more than 12,000 inhabitants in 1907 and was incorporated into the City of Stuttgart in 1933 (LHS Stuttgart (e), 2011). The subsequent favourable development is attributable in large part to the significant expansion of some industrial enterprises. The damages Feuerbach had suffered during the Second World War could have been overcome relatively quickly in the post-war years. The economic performance in the years after 1950 to today further expanded.

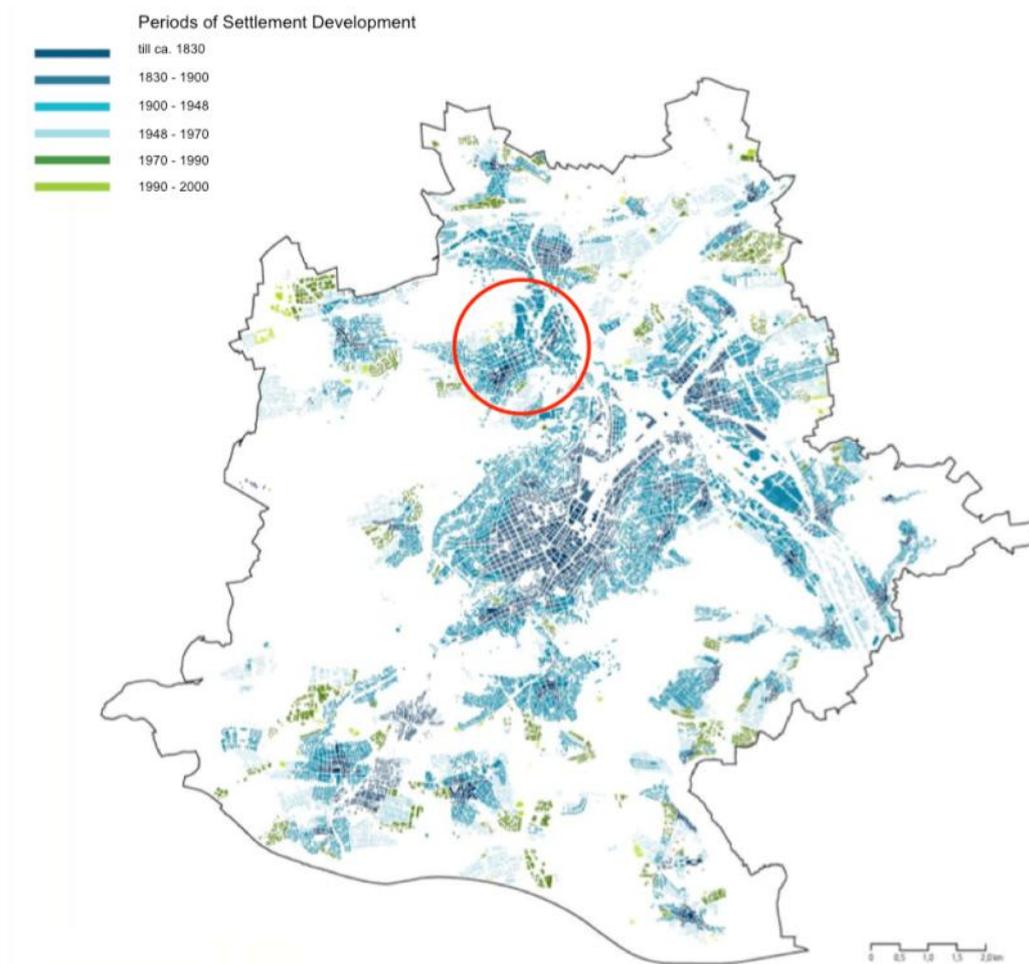
The reconstruction after 1945 was completed in the fifties. The expansion of the light rail in the period from 1988 to 1990, the construction of the B 295-tunnel in 1992, the expansion of Stuttgart Straße and lastly the redevelopment of the Roser-area up to 2002 were important milestones in Feuerbach's urban development. Feuerbach has today more than 27,000 inhabitants and 34 500 workplaces established in 1400 companies (Gewerbe-und Handelsverein Feuerbach e.V., 2010). Like all industrial shaped suburbs of Stuttgart, a restructuring process currently affects Feuerbach. Manufacturing jobs are being reduced and service jobs are increasing (LHS Stuttgart (e), 2011). The predicted population growth amounts to 2,6% by 2025, which is considerably higher than the overall population growth of Stuttgart for the same time period, which is just 0,2% (LHS Stuttgart (a), 2009). The city of Stuttgart and its districts are presented in Map 4.



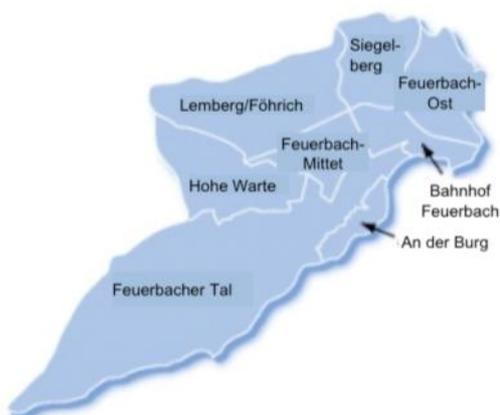
Map 4; City of Stuttgart, Source: (LHS Stuttgart (f), 2011)

Observing old maps it can be recognized that construction activities during Industrialization and also after the Second World War mainly took place along the river Neckar and the railroads. This applied primarily for the manufacturing industries, for which access to transport infrastructure was of utmost importance.

Today the district of Feuerbach consists of eight neighbourhoods. Its partition clearly reflects the historical development. The current Land Use Plan (2010) addresses the existing situation. The Land Use Plan 2010 of Feuerbach and the Pilot Site is presented in Map 6. Large connected areas designated as general commercial building areas (G) are reserved for industrial and commercial use located mainly in the east (341 Feuerbach Ost) and in the north (342 Siegelberg) of the train station and general mixed use areas (M) mainly in the southeast of the train station and west in direction to the district centre (343 Bahnhof Feuerbach) (see Figure 32). The designation of mixed use areas to achieve a balance between housing and commerce is a contribution to the vision of the “European City” model and takes into consideration the current restructuring process. Structural change promotes the closure of manufacturing companies. Small and medium sized areas turn into fallows. These areas up to 5 ha are forming a significant land potential in Feuerbach for inner-urban development (KMU, 2009; REFINA, 2011). On the other hand, these areas are often heavily contaminated by careless handling of environmentally harmful substances. Contamination are one of the biggest challenges of urban development in general and this also applies for Feuerbach. The spatial development of Stuttgart over time is illustrated in Map 5.

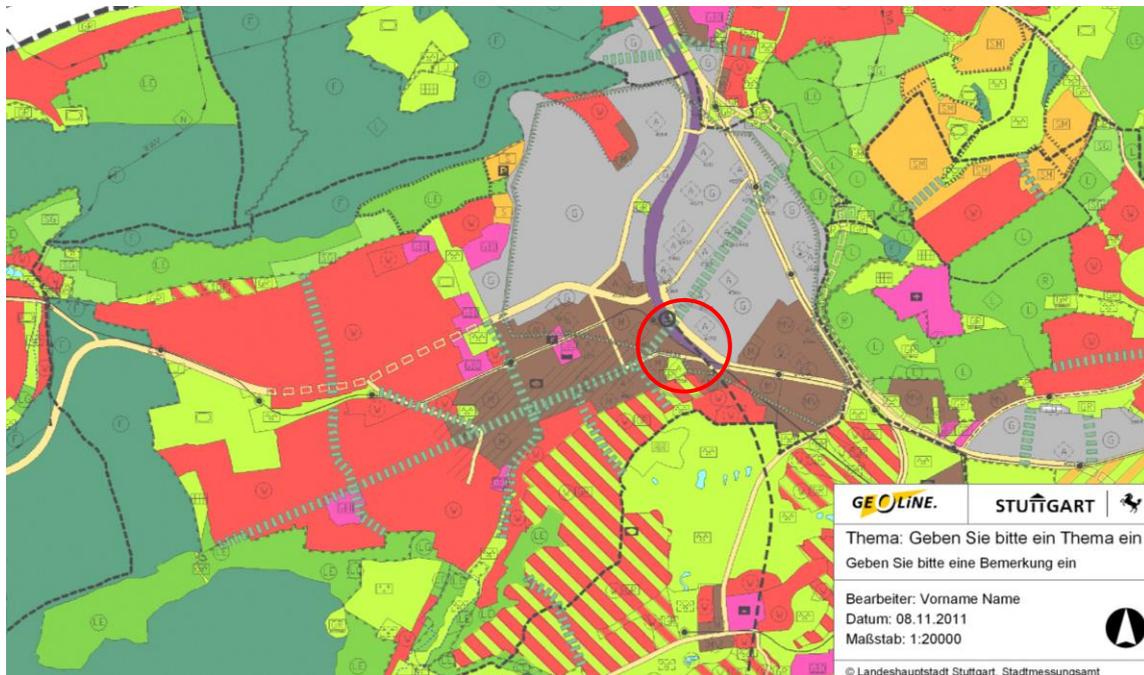


Map 5; Settlement development of Stuttgart from 1800 till 2000; Source: (LHS Stuttgart (b), 2004, p. 16); Translation by the author



Neighbourhoods: Number	Neighbourhoods: Name
341	Feuerbach-Ost
342	Siegelberg
343	Bahnhof Feuerbach
344	Feuerbach-Mitte
345	Lemberg/Föhrich
346	Hohe Warte
347	Feuerbacher Tal
348	An der Burg

Figure 32, Urban district Stuttgart – Feuerbach and its neighbourhoods; Source: (LHS Stuttgart (f), 2011); Translation by the author



Map 6; Land Use Plan Stuttgart 2010 – Feuerbach; Source: GEOLiNE

FLÄCHENNUTZUNGSPLAN 2010



Figure 33; Excerpt legend Land Use Plan 2010; Source: (LHS Stuttgart (a), 2004)

Feuerbach has a good retail infrastructure for the daily demand and also for specific demand. Recreational areas such as the “Feuerbacher Valley” and nature reserve “Lemberg”, with its vineyards are in close proximity. In addition to primary, secondary and intermediate schools, two high schools and four vocational schools are located in the district. Feuerbach is well accessible by public transport with tram and light-rail either from Stuttgart or the region. Numerous cultural institutions such as the theatre of Stuttgart, the free music centre, district library, music school and galleries as well as the sport-park and facilities for seniors, youths and children can be found in Feuerbach (LHS Stuttgart (e), 2011).

8.2.2 Urban Development Policies and Planning

Feuerbach is affected particularly of structural changes taking place in Stuttgart. Urban development planning in Stuttgart primarily focuses on these areas affected by structural change, in order to mitigate negative site-effects and to use the chance of released areas for urban development and city upgrades (Map 1). Conceptual approaches can be found in the “Urban Development Concept” (STEK) and “Urban Priority Areas for Development” (SVG). In addition special areas for urban development and urban renewal are designated in Stuttgart. Those areas can also be found in Feuerbach especially in the neighbourhood of the train station (Map 3). Planning in Stuttgart (see also chapter 6) is guided by urban development policies with the preference of inner-urban development. This strengthens particularly the challenging measures necessary to encounter the need for Brownfield development Feuerbach is facing. Limitation of buildable land is an important contribution for economically viable Brownfield development.

With its development policies Feuerbach aims on the balance of inhabitants and workplaces to reduce traffic. Those who work in Feuerbach also shall live in Feuerbach and shall be involved in activities on site (Ramp, 2011). New urban developments will ensure also in future Feuerbach as a location with high quality for working and living (Klöber, 2010).



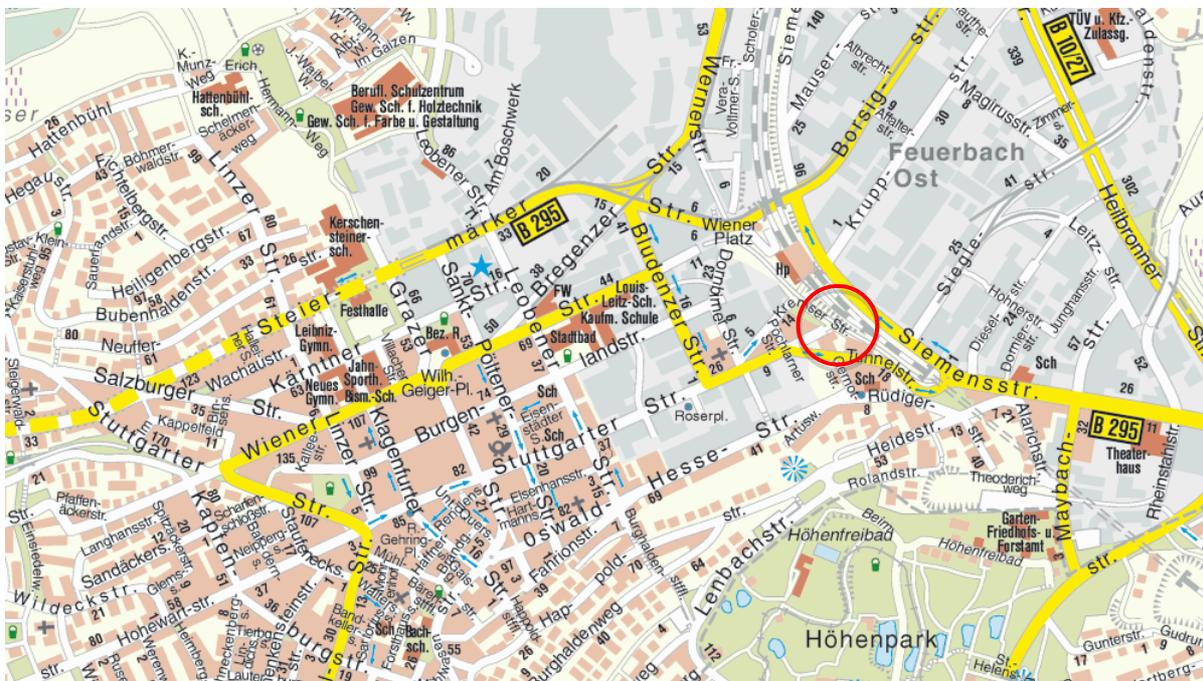
Figure 34; Advertisement Stuttgart – Feuerbach; Source: (Promotion Feuerbach)

8.3 The Perspective from the Project Level: The Micro level

On the micro level the neighbourhood of the Pilot Site is examined with respect to accessibility, centrality, environmental quality, emissions as well as current and planned development activities.

8.3.1 Location

The Pilot Site is located in the neighbourhood Feuerbach Train Station (343). In the east it is attached to the industry and commercial area Feuerbach East (341), by which it is separated by railway tracks and embankments. In the west it is linked to Feuerbach Centre (344) and Feuerbacher Tal (347). In the southeast rises the Killesberg (Höhenpark).



Map 7; Pilot Site Stuttgart-Feuerbach; Source:(LHS Stuttgart (g), 2011)

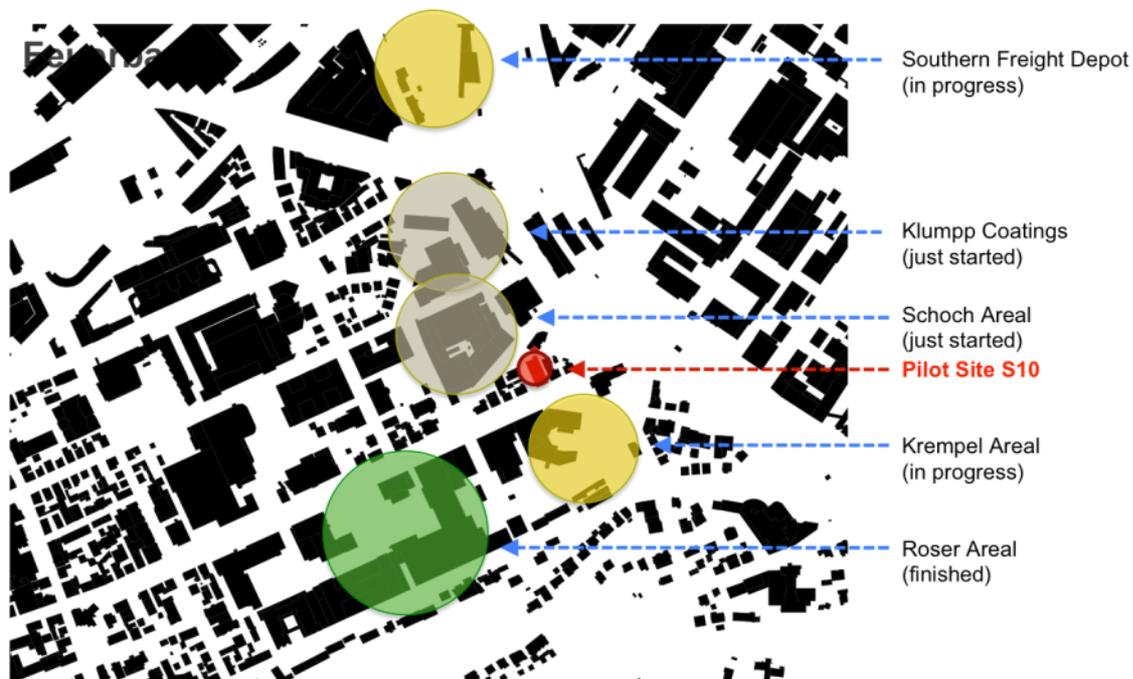
The site is located on the corner of an urban block comprising five buildings. On three sides it is defined with streets. In the south it adjoins the Stuttgartgarter Straße (B295), which is highly loaded with traffic. In the west the Pöchlamer Straße and in the north the Kremser Straße borders the Pilot Site. Both are residential roads with very low traffic. The Kremser Straße serves as the direct connection from the train station to the district centre and is mainly used by pedestrians.

The Pilot Site is located in absolute vicinity to the train station and close to the district centre. Infrastructure for daily needs is available comprising retail, health care, education and recreation. The city centre of Stuttgart is reachable with Public transport within eight minutes (SSB) either with commuter railway or with light railway. The same applies to destinations in the region of Stuttgart. The recreation area Killesberg is within a walking distance. The vineyards can be reached by bus within ten minutes. Even the accessibility by car is very good. The Heilbronner Straße (B10/27) is crossing the adjacent commercial area.

The environment of the Pilot Site Stuttgarter Straße 10 (S10) was formerly dominated by manufacturing trades. Due to the emerging service sector in Feuerbach during the last 15 to 20 years, a heterogeneous mixture of buildings of different uses and cubature developed. As essential uses large-scale retail (Roser Areal), offices, living, dining and public facilities can be identified (LHS Stuttgart, 2010, p. 8). Today mainly mixed uses can be found nearby, housing and commercial areas.

8.3.2 Current Urban Developments

Due to the already mentioned structural change a multitude of development activities takes place in the neighbourhood of the train station. The main activities are presented in Map 8. These developments have the quality to change the area around the train station into a lively and convenient neighbourhood.



Map 8; Urban Development in the neighbourhood of the Pilot Site S10; Source: (LHS Stuttgart, 2010, p. 10), Author

Roser Areal

The Roser Areal, a former industrial area for leather processing is located southwest of the Pilot Site. For the entire Roser Areal a mixed area with retail, services, offices, restaurants and culture, etc. was developed following the goal to upgrade the area and to make the area an attractive component of the Feuerbach centre. The planning has already been finished and is very well accepted (LHS Stuttgart, 2010, p. 9).

Tunnelstraße – former site of the company Krempel

The “Krempel Areal” is located south of the Pilot Site on the opposite side of Stuttgarter Straße. By reason of the redevelopment of the site an Implementation Plan for this area is under preparation including also the Pilot Site and its neighbouring plots. The involvement of public agencies is running. The area of the company has already been cleared for the future development. A draft for the area has been carried out by Schwarz Architects. The plan includes two buildings with mixed uses in direction to Stuttgart / Tunnel Straße (services,

retail + residential) plus three residential buildings (each about 15 units). Public green space as a green corridor is provided in direction to Killesberg (LHS Stuttgart, 2010, p. 9).

Schoch Areal

The Schoch Areal is located northwest in direct vicinity to the Pilot Site. The former metal processing company "hard chrome Schoch GmbH" stopped operation in 2008 and since then the area stayed vacant. The buildings (mostly storage and production halls, 1-3 floors) are in very poor conditions and partly contaminated due to past uses. The development of a sustainable concept for the site and the site-inherent potentials, noted as a possible "gateway to Feuerbach" has started. Challenges for a new development are extreme pollutions due to previous industrial use. In 2008 first urban orientation concepts were carried out during a REFINA research project (Figure 35). In 2011 the city of Stuttgart bought the site and a remediation report was elaborated. The further development time schedule includes a workshop with public participation in the beginning of 2012 and a subsequent urban design competition in the course of 2012. In 2013 the Implementation Plan is supposed to be continued on basis of the results of the urban design competition (Kron, 2011)

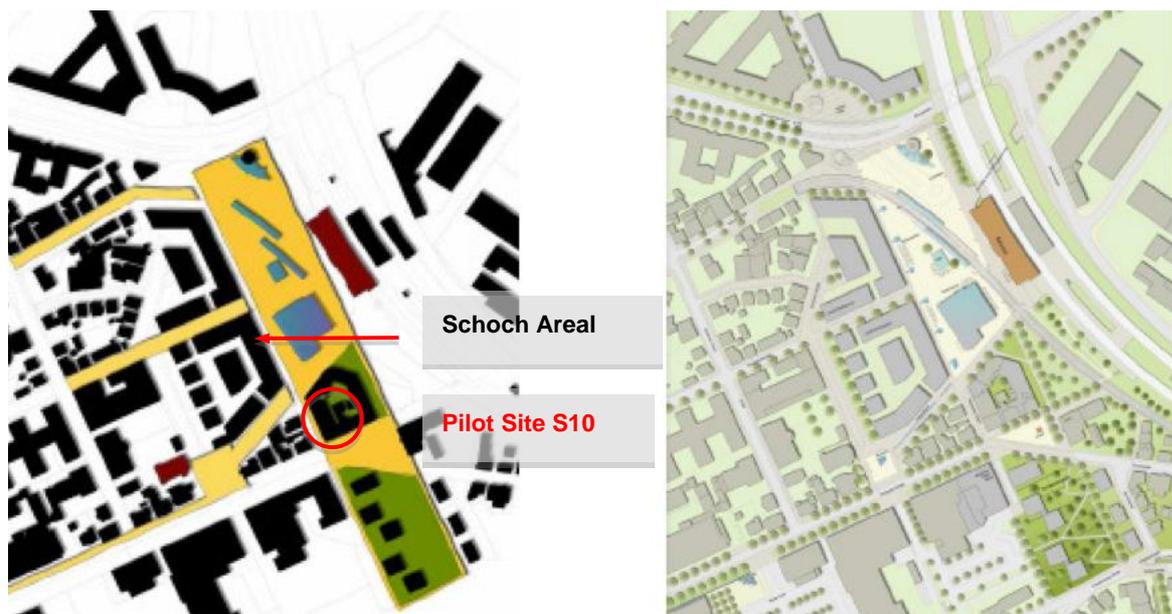


Figure 35; Results of the "Cooperative Planning Process" during the research project KMU KMF for the Schoch Areal in 2008; Source: (Kron, 2011), Processing by the author

8.3.3 Status of Planning

Urban Framework Plan Feuerbach Centre/Western Train Station Area

The Framework Plan "Feuerbach Centre" of 1996 includes the western train station area between Oswald-Hesse Straße, Grazerstraße, Steiermärker Straße and the railway station Feuerbach. It defines preconditions for realignment in accordance with restructuring and self-renewal processes in this area. Among others a positive urban appearance, a positive image and an improvement of living conditions shall be achieved while taking into account the interests of environmental protection, (LHS Stuttgart, 2010).

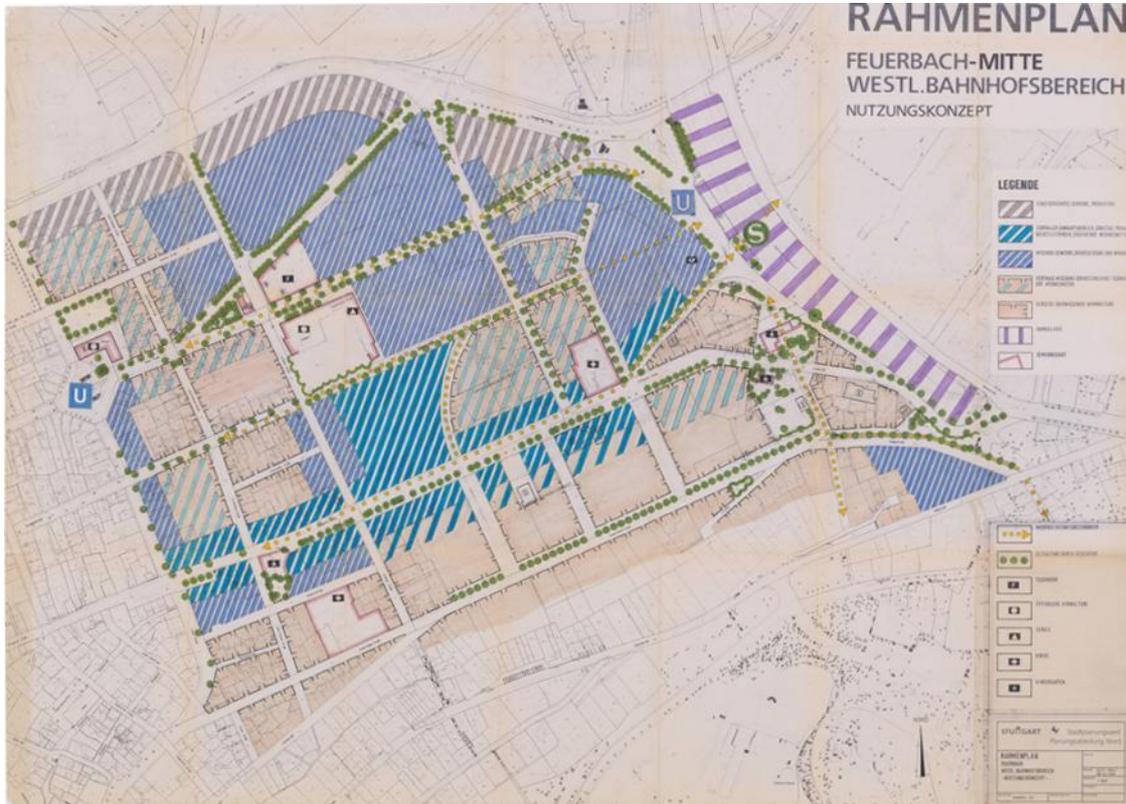


Figure 36; Framework Plan Feuerbach Centre / Western Station Area; Source: (LHS Stuttgart, 1996)

Priority Area (SVG) and Urban Renewal Area

The Pilot Site is situated in the urban priority area (SVG Feuerbach 5 Wiener Platz) and since 2000 it is part of the urban renewal area “Feuerbach 3” (see Annex 3) including the specific right of pre-emption. The focus of this renewal area with respect to the Framework Plan was to strengthen mixed use, modernization of the housing stock, the creation of new residential areas, structural improvements for pedestrians and cyclists, calming of traffic and the enhancement of green areas and public space (LHS Stuttgart, 2000).

Specific Right of Pre-emption

The specific right of pre-emption within the priority area mentioned above came into effect on the 12th November 1999. Its scope is to support a medium-to long-term reorganization of the entire development area “Wiener Platz”. According to (LHS Stuttgart, 1999) it shall specifically be used for:

- Merging of small plots and spread properties to enable reorganization in the medium to long term.
- Freeing up land within building blocks (block gutting)
- Transfer of privately owned, immediately buildable land, which is currently used for other purposes to qualified carriers and individuals in order to be used for construction (infill closure)

Development Perspectives

In 2009 the Office of Urban Planning and Renewal carried out a research on the “Requirements for the development of Schoch Areal from the perspective of urban development and housing policy”(Fricke, 2009). According to the analysis worked out the urban and spatial environment of the “Schoch Areal” is attributable to 'condensed inner-urban living in central and convenient location'. The surroundings of the “Schoch Areal” holds potentials for redevelopment of former industrial and commercial buildings. Public spaces are not adequately developed with respect to location and possible new uses. Inner-city locations for housing in proximity to central train stations are demanded both by potential residents as well as by developers. Suitable types of households are characterized as follows: Young households in education (18-30 years); Family households during the early phase (up to 45 years); Well-established elderly households (Generation 55 years and more) and mobile and flexible households (self-employed and freelancer). The Office of Urban Planning and Renewal recommends further developments of new forms of community and condensed living established as rented apartments and private property. Qualitative design in the vicinity of the train station must be secured and enhanced (LHS Stuttgart, 2010).

Transport Planning - Relocation of B295

Currently the B 295 is routed via Stuttgarter Straße and Tunnelstraße to “Pragsattel”. Thereby, the western part of the railway station of Feuerbach is affected by traffic and the district centre is separated. After the reconstruction of the Heilbronner Straße (expansion to six lanes) is completed (approximately 2012), the B 295 will be routed via the Borsigstraße/ Siemensstraße to “Pragsattel”. As part of this change traffic routing in Stuttgarter Straße and Tunnelstraße is limited to one lane and the traffic load will be substantially reduced. The traffic shift will enhance the neighbourhood. A new pedestrian and bicycle path will connect the Tunnelstraße via Stuttgarter Straße with the centre of Feuerbach (see Annex 4).

8.4 The Pilot Site Stuttgarter Straße 10

The analysis of the site itself focuses on the characteristics, which influence the land market value comprising status of site, form and extend of use, the standby time for structural or other utilisations as well as the composition and character of land property including reclamations costs and the market value.

8.4.1 History

The property S10 comprises two connected buildings. The older one was constructed in 1888 as a residential and office building. In 1955 a factory building was attached. In the beginning the property was used as a postal office (Postbauamt Stuttgart, 1898). From 1946 to 1976 the site was utilized for metal production (Rotax Stehle & Co.K.G, 1956). The property Stuttgarter Straße 10 was bought on recommendation of the Office of Urban planning in 1990. It was planned to reorganize the environment, in which some plots were already in public property (LHS Stuttgart (o), 2011). Chlorinated hydrocarbons CHC were detected during preliminary investigations for suspected contaminations, conducted in 1991. In 1994 groundwater treatment started, applying the Pump & Treat method. The urban renewal area Feuerbach 3 designated in 2000 also comprised the property Stuttgarter Straße 10 with the cadastral number 2457. Restoration plans worked out in 2005 and 2006 failed, because the tenant didn't want to move out. Purchase negotiations with the tenant in 2008 also failed (LHS Stuttgart (p), 2011). In the same year, detailed technical investigation of contaminations on the property started. In 2010 the tenant finally moved out. The Pump & Treat process was interrupted and the

elaboration of a remediation plan started and was completed at the end of 2011. It was decided to carry out a pilot test applying an innovative thermal in-situ remediation procedure. The historic development of the Pilot Site is listed in Table 12.

Date	Action
1888	Construction of residential and office building, Used as post office
1898	Structural extension
1943-1976	Used by metal processing companies
1955	Structural extension, factory building
ca. 1968	Structural changes
1976-2010	Used by metal processing company and as a carpet storage
1990	Purchase by municipality of Stuttgart, council resolution 13.12.1990
1991	Preliminary investigations of suspected contaminations, detection of CHC
1993-1994	Soil vapour extraction
1994-2010	Pump & Treat
2000	Part of urban renewal area 'Feuerbach 3
2005	Building restoration plan: tenant has to remove → not possible
2006	Revised restoration plan: restoration during ongoing operation → not profitable
2007	Property was offered for sale to the tenant → no interest
2008	Purchase negotiations failed
2008-2009	Detail technical investigation
2009	Decision for CityChlor's pilot test site
2010	Move-out of tenant
2010-2013	Interim rental to the Social welfare office
2010-2011	Remedial planning
2011	Decision for pilot test remediation applying thermal procedure

Table 12; History of Stuttgarter Straße 10; Source: See above, Processing by the author

8.4.2 Main Economic Characteristics

The Surveying Office carried out a Land Valuation for the Pilot Site in 2008. According to this Land Valuation (LHS Stuttgart (d), 2008) specific characteristics were identified. Information about contaminations was added according to (von Schnackenburg, 2010).

Description of Site (Status of Development)

The Pilot Site is currently built up and registered in the cadastre with the number 2457. Since 1991 the city of Stuttgart owns the site.

Form and extend of structural use

Form and extend of structural use for the Pilot Site is defined by the existing building law comprising building lines from 1891 and the “Baustaffelplan 3” from 1935 with a Plot Ratio of 40%, three possible stories and closed design (see Annex 2). The “Baustaffelplan 3” provides mixed use in its area of application.

The current extend of structural use can be calculated as:

GRZ ~ 0.64, GFZ ~ 1.5, 1 to 3 stories with open design. The form of use is mixed use.

Stand-by time for structural use

The buildings are rented out till 2013. Prior to re-building the site must be remediated or continuous groundwater treatment has to be ensured.

Composition and character of the land

The plot size amounts to 730 m² with a regular cut.

The site comprises a residential and an office building built in 1898 as well as an attached factory building built in 1955. The existing buildings both, the residential and office building and also the factory building are in need of rehabilitation and renovation. Exterior walls in basement and ground floor are suspected to be oil contaminated.

Buildings	Size (footprint)	Floor Space
Residential and office building	168 m ²	417 m ²
Factory building	289 m ²	680 m ²
Factory building	12 m ²	-
Garage	39 m ²	-
Sum	508 m²	1097 m²

Table 13; Footprint of existing buildings; Source: (LHS Stuttgart (d), 2008)

In the courtyard over an area of about 100m² severe contaminations with CHC were found. Contaminants were detected in soil, groundwater and indoor air. The pollution of indoor air was already cleaned up with a soil vapour extraction procedure applied in 1994. Groundwater was treated with Pump & Treat from 1994 to 2010. The site is registered in the municipal Brownfield cadastre ISAS with the number 2497.

The site is located in a mixed use densely built up area, close to the train station. Due to the B295 nearby with its high traffic loads the location is moderate to unfavourable.

The market value of the Pilot Site is indicated with 500,000 Euros.

For the calculation the standard ground value for simple housing locations was applied, which amounts to 530 Euros/m². The plot market value amounts to 386,900 Euros. Remaining living time of the buildings was estimated with 15 years, which results in earnings of around 115,00 Euros. The market value does not consider contaminations.

Location

The characteristics of the location have been already described in section 8.3.1.

8.4.3 Contaminations and Status of Investigation

The Pilot Site is highly polluted with CHC and registered in the Brownfield cadastre with the number 2497 (LHS Stuttgart (d), 2008, p. 3). Soil and groundwater are still contaminated. Indoor air has already been cleaned up. Even though the groundwater has been treated for 16 years the concentrations have not decreased. In addition contaminations from neighbouring sites (Schoch Areal) were attracted.

The Pilot Site is one of the most severe contaminated sites in the neighbourhood. Many small neighbouring sources and no spatial overview of groundwater quality impede investigation and remediation. Just few polluters can be hold liable. Existing treatment measures like on the Pilot Site are just applied for single sites. Sources therefore are in different status of processing. It has been shown, that current Pump & Treat remediation procedures are long-term procedures and ineffective for the existing contaminations and geology (von Schnackenburg, 2010). The hot spot could be determined. The source of contaminations is located in the court and covers an area of about 100m² (Annex 5). Different methods for remediation were analysed, costs and time needed were estimated and the reachable remediation result was assessed considering the existing circumstances. The densely built up environment, partly existing contamination beneath buildings and the geology impede the remediation procedure and have an impact on the reachable result and costs (Arcadis, 2011).

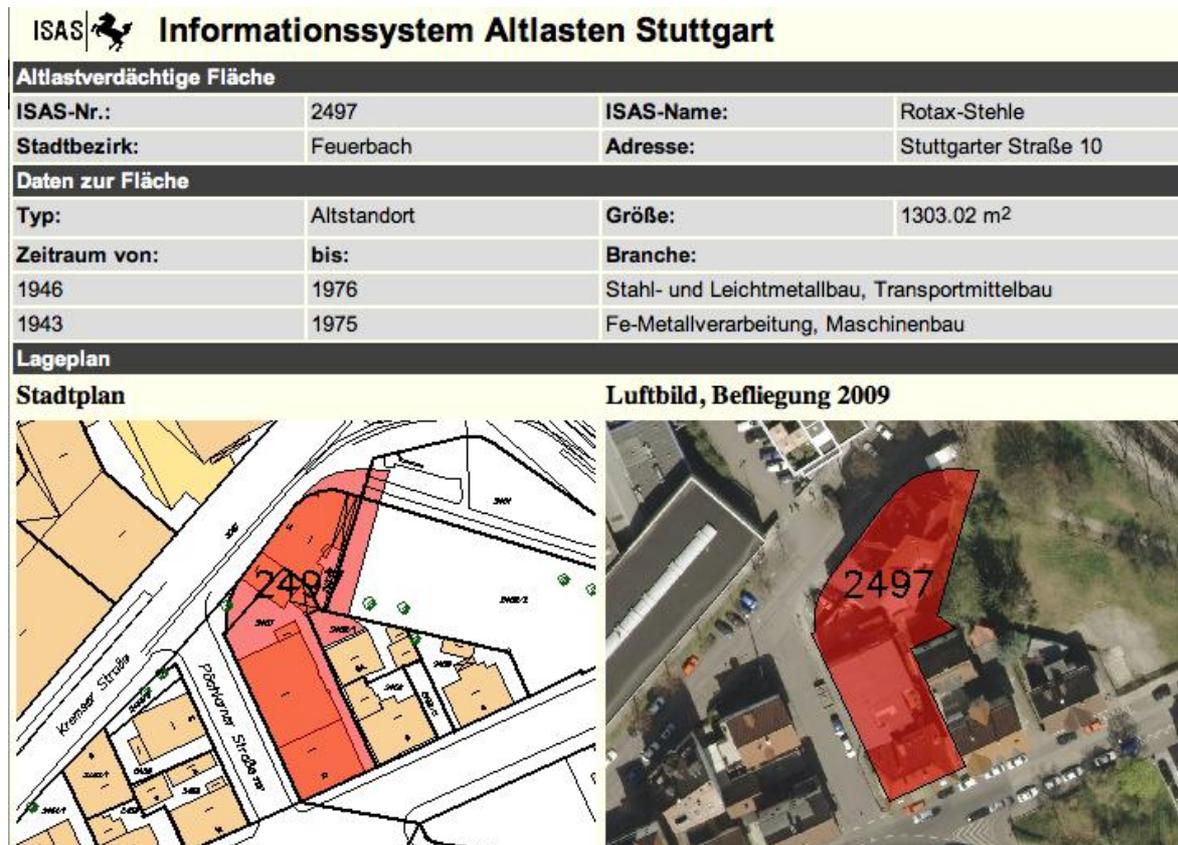


Figure 37; Excerpt municipal Brownfield information system ISAS, Stuttgarter Straße 10; Source: ISAS

Estimated remediation costs differ according to the method applied between 530,000 Euros and 1,000,000 Euros (Table 14). Investigation costs so far amount to about 250,000 Euros.

Procedure	Estimated Costs [€]
Decontamination with reaming using large hole boring	820.000 – 1.000.000
Safeguarding with Pump & Treat (20 years)	770.000 – 940.000
Decontamination using a fixed heat source and soil vapour extraction	
- Pilot test with subsequent full-scale remediation	590.000 – 730.000
- Full-scale remediation without pilot test	530.000 – 650.000

Table 14; Remediation costs related to method applied; Source: (Arcadis, 2011, p. 65), Translation by the author

8.4.4 Appraisal of Marketability

In the previous chapter several aspects contributing to the marketability of the Pilot Site were presented. As shown in section 5.3.1 the marketability of a Brownfield site can be calculated with the Market Value and estimated reclamation costs applying the A, B, C -model. For the current status of the Pilot Site the market value was calculated. In addition costs for investigation and remediation were estimated.

The Pilot Site shall now be categorized according to the A, B, C -model assuming that:

A-site: earnings > costs

B-site: earnings = costs

C-site: earnings < costs

For the categorization just the given figures for market value and investigation and remediation costs are considered. Further costs for demolition, mercantile reduced value, etc. are not taken into account. The formula for the calculation of the Land Market Value (FMW) (see section 5.3.2) is applied.

$$FMW = (UVW + F) - (GK + AK + SL + P + K)$$

UVW (Unbelasteter Verkehrswert):	Market value of unloaded land
F (Fördermittel):	Available grants that do not have to be paid back
GK (Gründerwerbskosten):	Land acquisition costs (e.g. purchase price, fees, charges, taxes)
AK (Aufbereitungskosten):	Reclamation costs (demolition, remediation and disposal costs , in general: all costs to clear the stigma)
SL (Sonstige Lasten):	Other expense (cost to settle static loads on the property, such as land charges)
P (Planungskosten):	Planning costs (effort to change the designation of planning law, for example, reports, fees, applications)
K (Rendite):	Return (normal return of investment plus risk premium)

The Land Market Value is calculated for Case 1: Minimum remediation costs and Case 2: Maximum remediation costs.

	Market Value(UVW) [€]	Funding (F) [€]	Purchase Price (GK) [€]	Reclamation Cost (AK) [€]		Land Market Value (FMW) [€]
				Investigation	Remediation	
Case 1	500,000	0	0	250,000	530,000	-280,000
Case 2	500,000	0	0	250,000	1,000,000	-750,000

Table 15; Calculation of Land Market Value; Source: Author

Finally it can be seen that the Pilot Site can be categorized as a C-site. Without funding earnings are far below the reclamation costs. In order to reduce costs for the public in general either the market value has to be increased or the reclamation costs have to be decreased or a combination of both.

9 Potentials for Development: The Pilot Site S10 in Feuerbach

This research aims on sustainable reintegration of small, contaminated Brownfields. The marketability of a site influences its reintegration into the economic market cycle. The Integrated and Area-oriented Approach aims therefore on increasing the marketability by improving the administrative processes, increasing the market value, reducing the reclamation costs and risks. To achieve the objective the proposed measures are applied on all strategic levels of sustainable Brownfield development, which are remediation, revitalization, reintegration and management. A possible practical application procedure of the Integrated and Area-oriented approach and necessary actions were addressed. The characteristics of the Case Study Area and Pilot Site were observed on the urban and the project level. This chapter focuses on the application of the Integrated and Area-oriented Approach on the Pilot Site. It is intended to identify the benefits the application of CityChlor measures and actions generates. On basis of a SWOT analysis a development strategy is compiled. This development strategy should then boost existing strength, eliminate weaknesses, implement opportunities and mitigate risks. The Potential Analysis identifies the possibilities of the site for a successful implementation of the development strategy. Scenario planning will display the results of an implementation process with and without consideration of the Integrated and Area-oriented Approach.

9.1 Appraisal of Case Study Area and Pilot Site

For the application of measures and actions, a thorough analysis and appraisal of information and data is prerequisite. This is especially true for a complex task like Brownfield development. It is necessary to detect at an early stage what, where and how actions have to be applied to increase the marketability in order to attract investments from the private sector.

9.1.1 Vendors Due Diligence

According to (WORLD-CHECK) „The words Due Diligence (DD) in the financial sense describe the process by which a bank or financial institution checks the identity, background and other aspects of the source of wealth of potential and existing customers.“ Usually a Due Diligence is conducted in order to prepare for the purchase of a company. So-called Vendors Due Diligence (VDD) is instructed by the vendor to prepare the sale of a company. In advance it carries out all the important information about the company. It helps to improve the basis for decisions, to reduce risks and to predict opportunities and risks. Both, vender and purchaser benefit from this procedure. Weaknesses can be tackled before sale and the already existing data accelerates the selling process (Deloitte, 2011). Due Diligence is also applied for the appraisal of real estate or project development. The SWOT Analysis is one of the instruments applied for a Due Diligence (Leipner).

9.1.2 SWOT Analysis

The SWOT Analysis is an instrument employed in urban planning to evaluate simultaneously Strengths and Weaknesses (internal origin) and Opportunities and Threats (external origin) of an urban area or a site. It enables a „direct correlation between the internal characteristics of a site and the external forces that affect it“ (Leyva Douat, 2009).

A SWOT analysis is carried out for the Pilot Site on the macro level (urban level), on the micro level as well as for the site itself.

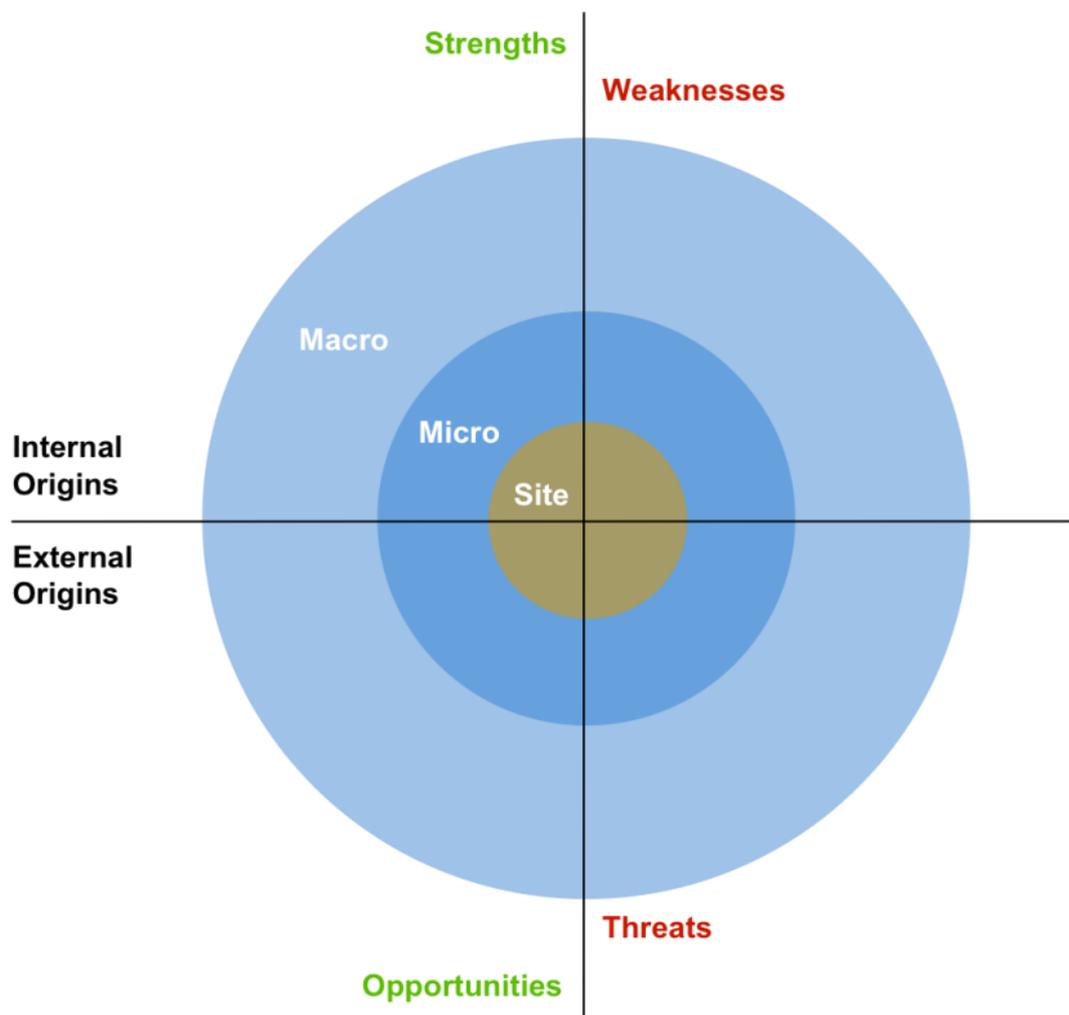


Figure 38; Matrix of SWOT Analysis; Source: Author

The consideration of the importance of these parameters can help to focus on the important aspects and therefore being able to influence them already at an early stage.

STRENGTHS			
INTERNAL ORIGINS	Urban Level	Project Level	
	Macro level	Micro level	Site
Reintegration (Location)	Attractive location for housing and commerce Location for culture (theatre, schools, community centre)	High centrality High accessibility (PuT and PrT) Mixed use area High densities Good public infrastructure Recreation (Killesberg) nearby Key location between train station and Killesberg Existing developments in neighbourhood (Schoch Areal, Krempel Areal), Planning available Green corridor, train station – Killesberg	Regular cut Small site (no internal circulation costs) With two sites adjacent to street (no structural disturbance) High current built density GRZ ~0.65, GFZ ~1.5
Revitalization (Urban Planning)	Neighbourhood “Bahnhof Feuerbach” part of focal points for inner-urban development (MV),	Located in Urban Priority Area (SVG) Part of Urban Renewal Area (Feuerbach 3) Municipal right of pre-emption “Bahnhof Feuerbach” in focus of urban development Decision for new Implementation Plan Small scale neighbouring plots in public property	Public property (development can be guided)
Remediation (Quality of land)		Polluted groundwater plumes are determined Neighbouring hot spots are localized, analysed and costs are estimated	Hot spots are localized Existing remedial investigation report with cost estimates for remediation
Management (Politics, Organisation, Communication)	Existing policies for attracting inhabitants and to supply housing, Existing policies supporting inner-urban development Availability of data and data management systems, NBS, “vacant lot” cadastre	Installed Brownfield Management for development of neighbouring Schoch Areal and new planning procedures applied (IPG, “cooperative planning process” during REFINA project)	

Table 16; SWOT Analysis – STRENGTH; Source: (LHS Stuttgart, 2010, pp. 37-39), Author

“Strengths” reflect the internal aspects, which contribute positively on the marketability of the Pilot Site.

WEAKNESSES			
INTERNAL ORIGINS	Urban Level	Project Level	
	Macro level	Micro level	Site
Reintegration (Location)		Connection for MIV (Motorized Individual Transport) from and to Stuttgart centre suboptimal. Unattractive train station square and post office building Unattractive facades of neighbouring buildings Vacant sites on both sides Noise from light rail and B295	Rented till 2013 Mainly interim uses like storage Low current GRZ (0.4) Small plot (730 m2)
Revitalization (Urban Planning)	Pilot Site is not considered in Urban Planning strategies Contaminations are not actively considered in Urban Planning strategies	Fund of Urban Renewal Area "Feuerbach 3" already exhausted Small scale neighbouring plots	Buildings old Buildings have to be refurbished (partly contaminated)
Remediation (Quality of land)		Highly contaminated neighbouring site (Schoch Areal) Contaminations partly beneath neighbouring building	Highly contaminated (soil and groundwater) High estimated remediation costs, Lacking space for efficient remediation procedure
Management (Politics, Organisation, Communication)	No interdisciplinary routine procedure for Brownfield development	Site-by-site Brownfield development	No development concept or strategy for Pilot Site

Table 17: SWOT Analysis – WEAKNESSES; Source: (LHS Stuttgart, 2010, pp. 37-39), Author

“Weaknesses” reflect the aspects, which hamper the marketability of the Pilot Site.

OPPORTUNITIES			
EXTERNAL ORIGINS	Urban Level	Project Level	
	Macro level	Micro level	Site
Reintegration (Location)	Expected population growth of 2,6% (among the highest outside the inner-city), More workplaces than inhabitants, Structural change increases possibility for urban upgrade on the micro level	New Implementation Plan with adequate higher densities Upgrade of urban neighbourhood considering historical context Qualitative architecture Calming of B295	Qualified urban density Increase of GRZ Increase of GFZ New building construction as a barrier against noise Mixed use with preference on housing
Revitalization (Urban Planning)	Structural change increases possibility for urban development Integrated and area-oriented development concept considering Schoch Areal, station square, Pilot Site and Krempel Areal	Integrated development (comprehensive concept for Pilot Site and neighbourhood) Realignment of neighbouring small scale plots Area-oriented development of neighbouring sites Sustainable developments Experimental approaches	Provision of qualitative housing Sustainable developments Experimental approaches
Remediation (Quality of land)	Structural change increases possibility for (area oriented) remediation	Improvement of urban and environmental quality Area-oriented remediation	Remediation of site Reduction of remediation costs with integrated development concept (remediation and construction)
Management (Politics, Organisation, Communication)	Existing data and data management systems, policies considering sustainable urban development as well as experience with new approaches are a good basis for the Application of Integrated and Area-oriented Approach	Search for political support (positive development creates reputation) Application of comprehensive and interdisciplinary procedure (consideration of Pilot Site and neighbouring plots) Active communication with owner and investor	Active communication and coordination (owner, tenant, investor, Joint building ventures)

Table 18; SWOT Analysis – OPPORTUNITIES; Source: (LHS Stuttgart, 2010, pp. 37-39), Author

“Opportunities” reflect the external aspects, which contribute positively on the marketability of the Pilot Site.

THREATS			
EXTERNAL ORIGINS	Urban Level	Project Level	
	Macro level	Micro level	Site
Reintegration (Location)	Structural change causes Brownfields with risk for urban decline	No demand No investor	No demand No investor Low architectural quality
Revitalization (Urban Planning)	No integrated and area-oriented development concept for the Pilot Site and its neighbouring Brownfields.	Owner does not want to sell Low quality architecture Remaining contaminations impede private investments No integrated urban development concept (Pilot Site + neighbouring developments)	No development concept
Remediation (Quality of land)	Lacking financial means for investigation measures	Area-oriented remediation is not applied Long term Pump & Treat procedure	Low remediation result (contamination could not be cleaned up adequately) No integrated remediation procedure High remediation costs
Management (Politics, Organisation, Communication)	No political and public support No interdisciplinary development procedures Lacking interest to evaluate existing procedures considering contaminated sites	No political and public support No interdisciplinary development procedures	No active communication and coordination

Table 19; SWOT Analysis – THREATS; Source: (LHS Stuttgart, 2010, pp. 37-39), Author

“Threats” reflect the external aspects, which hamper the marketability of the Pilot Site.

9.1.3 Development Strategy

The development strategy is derived from the SWOT Analysis. The development strategy should boost existing strengths, eliminate weaknesses, implement opportunities and mitigate threats on the urban and project level. With focus on sustainable reintegration of the Pilot Site into the economic market cycle the development strategy considers actions of the Integrated and Area-oriented Approach according to section 7.2 to increase the marketability by improving the administrative processes, increasing the market value, reducing reclamation costs and risks. According to the development strategy the Pilot Site is analysed with respect to the possibility for:

1. Application of area-oriented development
2. Setting of higher qualified densities
3. Implementation of mixed use with focus on qualitative housing
4. Implementation of constructive solutions to reduce impacts due to noise emissions
5. Integration in existing development process (Schoch Areal, Krempel Areal)

The development strategy assumes the application of integrated and area-oriented urban development procedures.

9.1.4 Potential Analysis

The Potential Analysis identifies the possibilities of the site for a successful implementation of the development strategy. It shall be analysed whether the development strategy is applicable for the Pilot Site. The analysis is carried out according to criteria presented above.

(1) Application of area-oriented development

The prerequisite for area-oriented development is a possible and reasonable extension of the site. The benefit of enlarged areas should be also reflected in the floor space ratio. The benefit of an area-oriented development must exceed the benefit of a single-site development, which can be improved living conditions, improved environmental conditions better integration into urban fabric, increased market value of development area and positive influences on the neighbourhood. Area-oriented development requires neighbouring connected sites of adequate size and form. Public property among the considered areas reduces negotiation with private owners and can therefore simplify the development process. Active coordination and communication has to be ensured by the public authorities. Being located within a Priority Area for Urban Development or Urban Renewal is helpful because it serves as a legal framework.



Figure 39; Ownership structure; Source: SIAS, Processing by author

The Pilot Site and its neighbourhood have the potential for area-oriented development. Small-scale neighbouring plots can be connected and form and size are adequate to achieve an improved urban situation. Connected sites form an enclosed area, which is well accessible. Land is partly in public property, what can boost the process.

(2) Setting of higher qualified densities

According to the Land Use Plan 2010 „qualified densities“ shall be achieved. This means adequate densities combined with high urban quality. According to existing densities in the neighbourhood and considering the central location close to the train station much higher qualified densities could be achieved than stated in the current valid law for the site „Baustaffel 3“.

(3) Implementation of mixed use with focus on qualitative housing

The achievement of mixed use areas with short ways, supply of daily demand nearby to avoid traffic is another goal of the Land Use Plan 2010. The current building law already considers mixed-use areas. Producing companies moved away. In the neighbourhood predominantly small businesses like restaurants and retail can be found. Due to high accessibility and centrality of the site development of qualitative housing is possible. This also applies for improving urban quality due to current neighbouring development projects.

(4) Implementation of constructive solutions to reduce noise impacts

The site is located in vicinity to the train station and adjacent to the B295 with high traffic loads. Impacting noise is predominantly caused by light railway. The commuter railways and regional trains are located more in the east and separated with an earth wall. According to the Office of Urban Planning and Renewal the implementation of existing planning for the calming of the B295 should take place within the next two years (approximately till 2013).

The area provides the form and space for a compact building structure, which is important for the reduction of noise impacts. A withdrawn development around an inner-court-yard, adequate structuring of floor plans and allocation of uses can contribute to achieve an environment for qualitative and comfortable living.

(5) Integration in existing development process (Schoch Areal, Krempel Areal)

Existing substantial developments in the neighbourhood can be considered as potentials for the Pilot Site. This is not just due to improvements of the urban structure and quality. The development dynamic can boost the development of the Pilot Site. The Pilot Site is located in the middle between the current development sites, the Schoch Areal in the Northwest and Krempel Areal in the South. Both developments are under public guidance and for the development of the Schoch Areal even progressive administrative structures are applied. Due to complexity a Brownfield Process Manager steers the development process of an interdisciplinary project group. Due to its central location between the two developing sites a comprehensive planning process considering the Pilot Site and its neighbouring sites is reasonable to achieve synergetic effects. This is especially important in the light of existing contaminations.

9.2 Scenario Planning

The method of Scenario Planning is a helpful instrument to investigate and present the benefits and bottlenecks for different actions applied and the effects obtained for sustainable reintegration of the site into the market cycle. In order to be able to evaluate the results the Base Scenario has to be defined. In this case the Base Scenario reflects the current state without application of measures (Scenario 1). Two further scenarios will then be elaborated. In comparison to the Base Scenario, for the second scenario (Scenario 2) the Integrated approach is applied. The third scenario (Scenario 3) applies both suggested measures of CityChlor, the Integrated Approach and the Area-oriented Approach. Finally the different scenarios are evaluated applying the assessment scheme elaborated in section 5.3.3.

Scenarios are performed according to:

- Measure applied for development (Integrated approach)
- Involved actors (Public, Owner, Investor, Tenant)
- Plot size (sqm)
- GRZ, GFZ (sqm)
- Projected Design
- Actions conducted
- Effects on the Reintegration and Marketability

9.2.1 Scenario 1: Base Scenario without Site Processing

SCENARIO 1					
Description: The site is not cleaned up but groundwater is continuously treated with Pump & Treat. The site shall be sold.					
Applied Measure: None					
Actors: Public					
Plot Size: 730 m²		GRZ	GFZ	Area	Floor Space
	Current law	0,40	1,20	292,00	876,00
	Status	0,64	1,50	467,20	1095,00
				Projected Design: None Existing buildings: Office and residential building built 1888, 2-stories Factory building built in 1957, 1-2 stories	
Actions:					
Fields of Actions	Urban Level		Project Level		
	(Macro level)		(Micro level)	(Site)	
Revitalization	Site was bought by public in 1991 due to planned urban development activities In 2000 included in urban renewal area Feuerbach 3		None	Planned and funded refurbishment could not be conducted due to existing tenant	
Remediation	None		None	Pump & Treat safeguarding groundwater quality	
Management	Initiation of Brownfield development process		None	In 2008 attempt to sell the property to the tenant.	
Effects on the Reintegration:				Marketability	
Revitalization	- Brownfield development is unlikely			None	
Remediation	- Long-term procedure; 20 years are estimated			None	
	- Estimated remediation costs: 30,000 €/year			None	
	- Result of remediation not clear			None	
Management	- Interim rental till 2013			None	

Table 20; S10 Scenario Planning: Scenario 1 without site processing; Source: Author

9.2.2 Scenario 2: Site Development with Integrated Approach

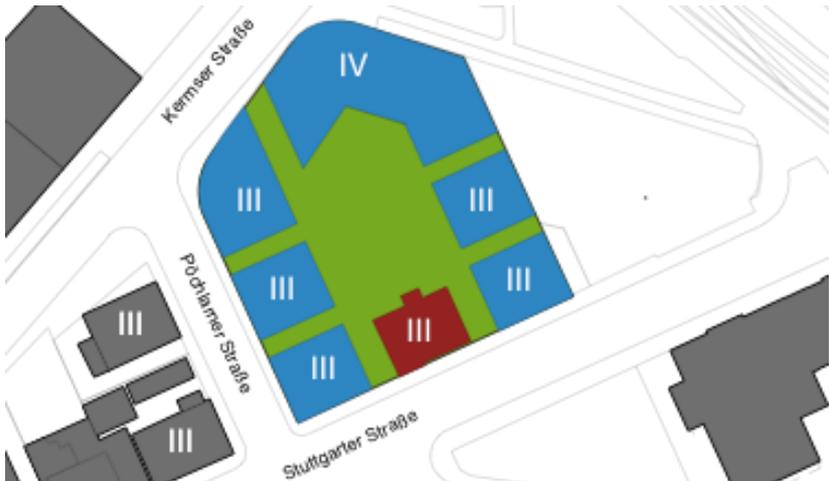
SCENARIO 2					
Description: The investigation of contaminants is carried out through the municipality. The site shall be developed together with the private sector. The currently valid building law (Baustaffel 3) is confronted with the current status and possible maximum densities.					
Applied Measure: Integrated Approach					
Actors: Public → Tenant, Investor					
Plot Size: 730 m²		GRZ	GFZ	Area	Floor Space
	Current law	0,40	1,20	292,00	876,00
	Status	0,64	1,50	467,20	1095,00
				Projected Design: Mixed Use (60% housing, 40% commerce) 3-4 stories GRZ 0.6 GFZ 1.85 Area 450 m ² Floor Space 1350 m ² Housing: 810 m ² Commerce: 540 m ²	
Actions of Integrated Approach:					
Fields of Actions	Urban Level	Project Level			
	(Macro level)	(Micro level)	(Site)		
Revitalization	Elaboration of specific site-related prudent development strategy for neighbourhood on micro level and site (Upgrade, GRZ, GFZ, Traffic) → (MV)	Observation of neighbourhood and site for upgrade and integrated development strategy → (MV)			Elaboration of integrated development concept (remediation integrated in development process) → (RC)
Remediation	Preparation of categorized (contaminations, possible uses, remediation costs) and prioritized (risk situation) data → (MV, RC, R)	Integrated investigation of pollutions and its sources regarding soil, groundwater, indoor air → (R, RC)		Remediation of all exposure pathways → (R)	
Management	Initiation of Brownfield development procedure		Communication and coordination of Brownfield development		

Effects on the Reintegration:		Marketability
Revitalization	Upgrade of neighbourhood (green areas, traffic reduction)	Increase of Market Value
	Consideration of Urban Development or Urban Renewal Areas (Funding for demolition)	Reduction of Reclamation Costs
	Integrated development concept for the site considering the environmental urban conditions on the micro level	Increase of Market Value
	Initiating development processes in the neighbourhood (Rising public awareness, Communication with investor, Marketing)	Increase of Market Value
	Higher possible densities for the site (GRZ, GFZ)	Increase of Market Value
	Integrated remediation procedure (reduction of costs due to reduced risk for existing buildings, security measures, synergetic effects with e.g. cellar or underground parking, reduced amount of contaminated soil)	Reduction of Risks Reduction of Reclamation Costs
Remediation	Comprehensive data as a basis for successful communication with investor	Reduction of Risks
	Comprehensive data is basis for sustainable planning decisions	Reduction of Risks
	Clear determination of sources (less remediation work)	Reduction of Reclamation Costs
	Comprehensive clean up of contaminants	Reduction of Risks
Management	Active development process	Improvement of Administration
	Transparent, simplified and streamlined development process (authority – authority, authority – investor)	Improvement of Administration
	Application of Project Manager, Interdisciplinary Project Groups	Improvement of Administration
Bottlenecks		
	<ul style="list-style-type: none"> - Remediation difficult due to narrow space - Additional costs for assurance of neighbouring buildings Kermser Straße 14 and Stuttgarter Straße 8a during remediation and construction - Additional Risks - Remediation result limited due to existing contaminations beneath neighbouring building Kermser Straße 14 - Application of innovative and cheaper method difficult due to danger for neighbouring building Kermser Straße 14 - Unsatisfactory urban solution 	

Table 21; S10 Scenario Planning: Scenario 2 with Integrated Approach; Source: Author

Costs for comprehensive investigation are high. The costs for investigation are increasing with more detailed information. These costs have to be financed by the public. Complex contaminations like those caused by VOCs bear large uncertainties for investors. Therefore a clarified situation is the prerequisite to attract private investments for a site such as S10. Comprehensive investigation highly contributes to the marketability of the site, directly by reduction of risks and indirectly by the reduction of reclamation costs due to possible selective remediation of hot spots.

9.2.3 Scenario 3: Site Development with Integrated and Area-oriented Approach

SCENARIO 3					
Description: Investigation of contaminants is carried out through the public. The site shall be developed together with the private sector. Remediation shall be integrated in the construction process. The currently valid building law (Baustaffel 3) is confronted with the current status and possible maximum densities. The remediation and development of S10 is carried out along with adjacent sites.					
Applied Measure: Integrated Approach and Area-oriented Approach					
Actors: Public → Owner, Tenant, Investor					
Plot Size: 2466 m ²		GRZ	GFZ	Area	Floor Space
	Current law	0,40	1,20	986,80	2959,20
	Status	0,46	1,20	1134,40	2959,20
				Projected Design: Mixed Use (60% housing, 40% commerce) 3-4 stories GRZ 0.6 GFZ 2.0 Area 1478 m ² Floor Space 4959 m ² Housing: 2975 m ² Commerce: 1984 m ²	
Actions of Integrated Approach and Area-oriented Approach					
Fields of Actions	Urban Level	Project Level			
	(Macro level)	(Micro level)	(Site)		
Revitalization	Elaboration of area-oriented specific site-related provident development strategy for neighbourhood on micro level and site (Upgrade, GRZ, GFZ, Traffic) → (MV)	Observation of neighbourhood and site for upgrade and integrated and area-oriented development strategy → (MV) Elaboration of integrated and area-oriented development concept (remediation integrated in development process) → (RC)			
Remediation	Preparation of categorized (contaminations, possible uses, remediation costs) and prioritized (risk situation) data → (MV, RC, R)	Integrated and area-oriented investigation of pollutions and its sources regarding soil, groundwater, indoor air → (R, RC) Area-oriented remediation of all exposure pathways → (R)			
Management	Area-oriented initiation of Brownfield development procedure	Area-oriented communication and coordination of Brownfield development			

Effects on the Reintegration (Policies):	Marketability	
Revitalization	Integrated Approach	
	Upgrade of neighbourhood (green areas, traffic reduction)	Increase of Market Value
	Consideration of Urban Development or Urban Renewal Areas (Funding for demolition)	Reduction of Reclamation Costs
	Integrated development concept for the site considering the environmental urban conditions on the micro level	Increase of Market Value
	Initiating development processes in the neighbourhood (Rising public awareness, Communication with investor, Marketing)	Increase of Market Value
	Higher possible densities for the site (GRZ, GFZ)	Increase of Market Value
	Integrated remediation procedure (reduction of costs due to reduced risk for existing buildings, security measures, synergetic effects with e.g. cellar or underground parking, reduced amount of contaminated soil)	Reduction of Risks Reduction of Reclamation Costs
	Area-oriented Approach	
	Area-oriented development site specific concept integrated in current development concepts in the neighbourhood	Increase of Market Value
	Area-oriented remediation procedure integrated in construction process (no constraints due to existing buildings, increased synergetic effect with e.g. cellar or underground parking, no security measures for neighbouring buildings)	Reduction of reclamation costs
Remediation	Integrated Approach	
	Comprehensive data as a basis for successful communication with investor	Reduction of Risks
	Comprehensive data is basis for sustainable planning decisions	Reduction of Risks
	Clear determination of sources (less remediation work)	Reduction of Reclamation Costs
	Comprehensive clean up of contaminants	Reduction of Risks
	Area-oriented Approach	
	Area-oriented clean up of neighbouring hot spots and contaminations formerly existing beneath neighbouring buildings	Reduction of Risks
Application of innovative, cheaper and more effective remediation methods	Reduction of reclamation costs and risks	
Management	Integrated Approach	
	Active development process	Improvement of Administration
	Transparent, simplified and streamlined development process (authority – authority, authority – investor)	Improvement of Administration
	Application of Project Manager, Interdisciplinary Project Groups	Improvement of Administration
	Area-oriented Approach	
	Area-oriented development procedure integrated in current development activities in the neighbourhood	Improvement of Administration

Table 22; S10 Scenario Planning: Scenario 3 with Integrated and Area-oriented Approach; Source: Author

9.2.4 Comparison of Scenarios

The carried out scenarios present different procedures for the development of contaminated sites. To come to a conclusion about the quality of these scenarios they are now being evaluated according to the criteria of marketability applying the assessment scheme carried out in section 5.3.3. The following assessment scale will be applied: -1, 0, 1 with -1 predominantly negative, 0 predominantly not available, 1 predominantly positive

Group of Criteria	Criteria	Scenario 1	Scenario 2	Scenario 3
Regulation and Administration (BauGB, 1999),(City Chlor (a), 2011)	Influence of policies with preference for inner-urban development	0	1	1
	Organisation	-1	1	1
	Communication	-1	1	1
Market Value (WertV, 1988)	Status of development	-1	1	1
	Form and extend of structural use	-1	0	1
	Value influencing rights and burdens	0	0	0
	Legal status of fees and cessions	0	0	0
	Standby time for structural or other utilizations	-1-	1	1
	Composition and character of the land property	-1	0	1
	Location	0	1	1
Reclamation Costs (difu, 2006)	Demolition	-1	1 ¹	1 ¹
	Remediation and Disposal (including costs for future observations)	-1	0	1
Risk (REFINA, 2011)	Stigma and marketing risk	-1	0	1
	Risk of investment	-1	1	1
	Risk of usability	-1	1	1
	Risk of utilization	-1	0	1
Sum		-12	9	14

Table 23; Assessment scheme for development scenarios; Source: Author

The Pilot Site is located in the Urban Renewal Area Feuerbach 3, which in the near future will be completed (end of 2012). Several areas in the neighbourhood are in the stage of development (Schoch Areal, Kühlhaus Krempel), for others, the development is already completed (Roser Areal). Planning and prerequisites for the calming of the B295 have been accomplished and the measure is to be implemented over the next two years (approximately till 2013).

The described facts and measures have substantial positive influence on the marketability of S10. The Urban Renewal Area can supply funds for refurbishment or demolition of buildings. Ongoing development and

¹ It is assumed that demolition costs are fully or partly funded due to Urban Renewal Area

upgrade in the neighbourhood with accompanied remediation procedures of contaminants, change in use, available greenery and facilities for daily demand contribute to an increasing attractiveness of the neighbourhood and can significantly increase the market value of S10. The calming of B295 is a very important measure for S10. Today noise emissions are very high, which negatively impacts on the attractiveness of the development of housing in its neighbourhood. The significant calming of the B295 again has a positive influence on the market value of S10 and its marketability.

The application of the Integrated Approach could have contributed even better at an earlier stage to the development of S10 even though some developments like those currently going on in the vicinity are hardly to be foreseen. Anyway active urban development strategies can influence and direct processes in the desired way.

The scenarios have shown, that the application of the Integrated and Area-oriented approach has positive effects on administrative processes as well as on the Market Value, the Reclamation Costs and the perceived and anticipated Risks of developments of polluted sites. Several variables of the formula for the calculation of "land market value" FMW (see section 5.3.2) can be influenced by the Integrated and the Area-oriented approach (red).

$$\text{FMW} = (\text{UVW} + \text{F}) - (\text{GK} + \text{AK} + \text{SL} + \text{P} + \text{K})$$

UVW (Unbelasteter Verkehrswert):	Market value of unloaded land
F (Fördermittel):	Available grants that do not have to be paid back
GK (Gründerwerbskosten):	Land acquisition costs (e.g. purchase price, fees, charges, taxes)
AK (Aufbereitungskosten):	Reclamation costs (demolition, remediation and disposal costs, in general: to eliminate all costs to clear the stigma)
SL (Sonstige Lasten):	Other expense (cost to settle static loads on the property, such as land charges)
P (Planungskosten):	Planning costs (effort to change the designation of planning law, for example, reports, fees, applications)
K (Rendite):	Return (normal return of investment plus risk premium)

With the correct application on the one hand necessary investments by public authorities for remediation of contaminations (B and C-sites) can be reduced and on the other hand investors can be attracted. In addition also social costs due to mitigation of urban development blockage and remaining soil and groundwater contaminations can be reduced. It is needless to say that the right framework conditions, which can be found in Stuttgart, are prerequisite to achieve the mentioned results.



IV BENEFITS OF THE INTEGRATED APPROACH

“It is not the strongest of the species that survive, not the most intelligent, but the one most responsive to change.” (Charles Darwin, scientist)

10 Summary

10.1 Summary Appraisal of Brownfields

Economic characteristics of Brownfields have been detected to assess land marketability. The knowledge about economic characteristics serves as a prerequisite to efficiently apply new measures for the improvement of marketability and to evaluate the quality of results. Criteria for evaluation are summarized in Table 24.

Group of Criteria	Criteria
Regulation and Administration (BauGB, 1999), (City Chlor (a), 2011)	Influence of policies with preference for inner-urban development, Organisation Communication
Market Value (WertV, 1988)	Status of development Form and extend of structural use Value influencing rights and burdens Legal status of fees and cessions Standby time for structural or other utilizations Composition and character of the land property Location
Reclamation Costs (difu, 2006)	Demolition Remediation and Disposal (including costs for future observations)
Risk (REFINA, 2011)	Stigma and marketing risk Risk of investment Risk of usability Risk of utilization

Table 24; Criteria for assessment of land marketability; Source Author

10.2 Summary Practice of Brownfield Development in Stuttgart

There are two main features, which qualify development processes: the methodology used and the quality of the management process itself. According to the methodology of municipal Brownfield management (Figure 6) presented in section 5.2.2 the management of Brownfields in Stuttgart will be analyzed. The three main steps are: data acquisition, data management and visualization, area appraisal and finally the evaluation of potential developable land.

Data Acquisition and Visualization

As already carved out in section 6.2.5 any kind of data and information needed for inner-urban development and especially Brownfield development exists and is either available as alphanumeric data or visualized in the municipal geographic information systems. If necessary, data can be overlaid and queried. Numerous reports about development policies and concepts, accomplished research projects as well as funding potentials are provided both online and in paper form. The same is true for statistical and raster data.

Area Appraisal

Potential land for inner-urban development is classified according to floor space. Two main categories are distinguished: Land > 2000m² potential additional floor space, which is stored in the NBS and land < 2000m² potential additional floor space, which is stored in the cadastre for “vacant lots”. Municipal as well as private properties are included. Land stored in the NBS is qualified by the following characteristics (Krieger, 2009):

- Floor space: Sites with a minimum of 2000m² potential additional floor space.
- Legal framework: Sites identified as building areas in the land use plan or with valid building law displayed in the implementation plan.
- Development potential: All desirable urban development potentials without consideration of existing obstacles for realization.
- Green areas are not considered.
- Planning horizon: Expected possible time for realization 10-15 years. Visionary potentials are not considered.

These areas are stored together with relevant thematic information for the appraisal of development potentiality. Indicators can be possible densities, possible uses, owner structure, legal situation, contaminations, land value and so further, influencing the economic viability and marketability of the site and respective development projects.

The A-B-C Model is applied to categorize NBS sites according to their marketability using the indicator of market value and reclamation costs. As a result most of the available sites are classified as B or C sites, which is due to often existing conflicting objectives between different owners or public authorities and contaminations (LHS Stuttgart (a), 2003, p. 103).

Evaluation

The areas are then classified according to their temporal development potential with respect to possible uses for housing and industry/commerce and listed in “Zeitstufenlisten”.

Since 1979 the city of Stuttgart has designated so-called “priority areas” (SVG) as a basis for the designation of “urban development and urban renewal areas” in the city according to the development policies in Stuttgart and criteria listed in the federal building code (BauGB). “Focal points for inner-urban development” of NBS registered lots are identified considering the category of marketability, potential development in time, location and needs for urban development and urban renewal. The following output maps are generated guiding urban planning and renewal in Stuttgart:

- Land potentials for inner-urban development (NBS)
- Focal points for inner-urban development (NBS)
- “Zeitstufenliste housing” (NBS)
- “Zeitstufenliste industry and commerce” (NBS)
- Priority areas (SVG) for urban development and urban renewal

The obtained maps serve as a basic tool for inner-urban development in Stuttgart on basis of the Land Use Plan 2010 and the concept for inner-urban development in Stuttgart (STEK) and are applied by all involved

departments and offices shown in section 6.3.1. On basis of the identified maps the urban planning authorities actively initiate and support inner-urban development e.g. in some cases a test-planning is carried out to analyse possible densities, handling of contaminations and so further. This is very helpful for the marketability of sites. More information decreases risk and hence increases the land market value (see section 5.3.2)

Contaminations are therefore just indirectly considered as criteria for the indicator of marketability in the applied A-B-C model and in the timeline for development and do not actively contribute to decision-making for where and when urban development should take place. Contaminations on the urban planning level (the macro level) are not considered as direct trigger for urban planning. Just in case of existing disturbances and blockages of urban development, which often takes place due to existing or suspected contaminations the respective site is processed as part of an urban development or urban renewal area or registered in the NBS. Nevertheless information about existing or suspected contaminations are always integrated and part of area descriptions (NBS areas).

Areas smaller than 2000m² potential additional floor space, stored in the “vacant lot cadastre” and not located within designated areas prior for urban development or urban renewal are not actively promoted by public urban planning authorities. Contaminations are registered for municipal properties.

Underutilized or partly underutilized land and vacant lots in commercial areas are not yet surveyed (LHS Stuttgart (c), 2008, p. 7).

Management Process

Inner-urban development is complex if various, public and private stakeholders are involved. Contaminations cause reclamation costs and risks. Marketability of Brownfield sites is not assured. In order to avoid urban development blockages and to support remediation of contaminations, the city of Stuttgart actively supports the development process. Diverse organisational procedures on different planning levels and according to project size and complexity can be applied. Project manager, area manager, interdisciplinary project groups and the NBS working group ensure the quality of development processes as well as information flow on different planning levels. Public competences are bundled and planning and development procedures are more efficient, which is attractive for investors.

The NBS information platform and the maps worked out guarantee comprehensive and up-to-date data for planning and decision-making on the urban and project level. Relations and interdependencies already can be recognized on the macro scale. Comprehensive data assists long-term planning decisions e.g. purchase of land to achieve urban development goals. Informal cooperative planning processes support the project quality and stakeholder involvement. Economic, environmental, social and technical aspects can be integrated in the planning already at an early stage. However innovative management methods are mainly just applied for funded research projects and not yet part of routine procedures for Brownfield development of contaminated Brownfields.

10.3 Summary CityChlor Approach and theoretical Application

The CityChlor approach proposes two measures to improve processing of contaminated Brownfields considering the urban scale and the economic perspective. The proposed measures, Integrated Approach together with Area-oriented Approach can be applied on urban level, (macro level) and on project level (micro and site level). They aim on the integration of all aspects contributing to find a good solution for the site and space.

The possibility for an application of the Integrated and Area-oriented Approach on the organizational level has been investigated theoretically. The proposed data overlay has considered the existing data management system SIAS used by the municipality of Stuttgart. It has been shown that the required data is already available and just has to be applied respectively. In addition it has turned out that the application of these approaches can have various benefits, which are the improvement of administrative procedures, the possibility to increase the market value of the site, the possibility to reduce reclamation costs and risks. The application of the Integrated and Area-oriented Approach as presented is possible within the existing planning environment in Stuttgart. Required actions on the planning as well as on the implementation level to increase the marketability of contaminated Brownfields are summed up in Table 25.

	Urban level (Macro level)	Project level	
		(Micro level)	Site
Urban planning and urban development (Revitalization)	Consideration of all polluted Brownfield sites for inner-urban development Integrated and Area-oriented specific site-related development strategy for the micro level	Integrated and Area-oriented development concept for the polluted Brownfield site Remediation concept integrated into the construction process	
Environmental engineering (Remediation)	Survey of polluted Brownfields and categorization of contaminations (criteria: contamination, possible uses, cost estimates), Prioritisation	Integrated and Area-oriented investigation of soil, groundwater and indoor air pollution and its sources Integrated and Area-oriented remediation of Hot Spots considering all exposure pathways	
Organisation and communication (Management)	Integrated and Area-oriented initiation of Brownfield development procedure, eventually purchase of neighbouring properties	Integrated and Area-oriented communication and coordination of Brownfield development	
Economic aspects (Reintegration)	Improvement of administrative processes (Interdisciplinary project groups, project manager, area manager), Increase of market value (environmental upgrade around polluted Brownfield site on micro level), Reduction of risks (coordinated, streamlined, transparent administrative processes)	Reduction of risks (integrated and area-oriented investigation of contaminants) Increase of Market Value (extension of development site) Reduction of reclamation costs (hot spot remediation) Reduction of reclamation costs (integrated remediation and construction process)	

Table 25; Actions of Integrated and Area-oriented Approach; Source: Author

10.4 Summary Analysis of Pilot Site

It has been shown that the Pilot Site is categorized as a C-site according to the A, B, C-model. This is due to costs, which highly exceed the earnings. Development of C-sites requires an active role of public authorities. The applied market value is based on a standard land value (Bodenrichtwert) from 2008 and does not consider future planning e.g. calming of B295 and upcoming developments in the neighbourhood of the Pilot Site. Planning especially for upgrading the environment of the train station can substantially contribute to change the existing derelict character of the area. This also applies for the planned development on the Krempel Areal. It has been shown that the need for development and housing is given. But it also became clear that the Pilot Site is not yet actively integrated in the development process of the neighbourhood, although it is located in the middle of current development actions. This is due to size and lacking development pressure. On the one hand the Pilot Site is too small, does not appear in the NBS and is therefore not in the focus. On the other hand the Pilot Site does not cause any perceived harm, which would attract the attention either of planning authorities or of the population. There is no „psychological strain“, which would cause pressure on the planning authorities. In the case of the Pilot Site the pressure is just with the authorities involved in the remediation process like the Environmental Protection Office and the Civil Engineering Office, which have to find the financial means. The Office of Real Estate and Housing is still able to rent the property. Expensive investments to upgrade the property are not necessary for current interim uses as storage.

10.5 Summary Development Potentials

A Vendors Due Diligence has been applied on the Pilot Site. The instrument of SWOT Analysis was used to detect existing strengths and weaknesses as well as opportunities and threats on urban and project level as a prerequisite for the elaboration of an adequate development strategy. The Vendors Due Diligence investigates the situation from the perspective of investors in order to prepare adequately. Transferred to Brownfield development, it can be described as an active development procedure. The derived development strategy applies the measures of the Integrated and Area-oriented Approach to improve marketability. The potential analysis of the Pilot Site on the project level has confirmed the potentials to increase marketability. The development strategy was employed on the Pilot Site using test planning with different scenarios. Actions of the Integrated and Area-oriented Approach have been applied on urban and project level and effects on the marketability have been investigated. The final evaluation of the scenario planning has displayed that the attainable benefit is the highest in case that performed actions of the Integrated and the Area-oriented Approach are bundled.

The mainly performed actions of Integrated and Area-oriented Approach to support reintegration of the Pilot Site and its direct benefits for the marketability are illustrated in Table 26.

Measures		Actions	Effects			
Integrated Approach	Area-oriented Approach		Improvement of administration	Increase of Market Value	Reduction of Reclamation Costs	Reduction of Risks
Revitalization						
X		Upgrade of neighbourhood (green areas, traffic reduction)		X		X
X		Consideration of Urban Development or Urban Renewal Areas (Funding for demolition)		X	X	
X		Integrated development concept for the site considering the environmental urban conditions on the micro level		X		
X		Initiating development processes in the neighbourhood (Rising public awareness, Communication with investor, Marketing)		X		X
X		Elaboration of an Implementation Plan with adopted densities, heights, uses, spacing (GRZ, GFZ)		X		
X		Integrated remediation procedure (synergetic effects with e.g. cellar or underground parking)			X	X
	X	Area-oriented development site specific concept integrated in current development concepts in the neighbourhood		X		
	X	Integration of area-oriented remediation procedure in construction process (no constraints due to existing buildings, increased synergetic effect with e.g. cellar or underground parking, no security measures for neighbouring buildings)			X	X
Remediation						
X		Comprehensive data as a basis for successful communication with investor				X
X		Comprehensive data is basis for sustainable planning decisions			X	X
X		Clear determination of sources (less remediation work)			X	X
X		Comprehensive clean up of contaminants (in soil, groundwater and indoor air)		X		X
	X	Area-oriented clean up of hot spots and contaminations formerly existing beneath neighbouring buildings		X	X	X
	X	Application of innovative, cheaper and more effective remediation methods			X	X
Regulation and Administration						
X		Initiation and active processing of Brownfield development	X		X	X
X		Simplification and streamlining of development processes (authority – authority, authority – investor)	X		X	X
X		Application of Project Manager, Interdisciplinary Project Groups, Cooperative planning as routine procedure	X		X	X
	X	Integration of area-oriented development procedures in current neighbouring development activities	X	X		X

Table 26; Effects of Integrated and Area-oriented Approach; Source: Author

11 Conclusion and Recommendations

This paper dealt with the economic perspective of Brownfield development and therefore is already a reduced presentation of the real existing complexity of Brownfield development. Nevertheless the economic issue is the most determining issue not just for Brownfield development but also in general term. Development has to be financed and money is a scarce resource. Even though the decisions of politics and public authorities should first of all be based on the social needs the economic aspect is then finally the constraining issue. What is true for social needs is also true for progress. Progress also in protecting our environment is costly and therefore demanding. Politics and adequate institutional procedures can make the difference to achieve stated goals.

Inner-urban development policies like in Stuttgart are a strong contribution for environmental protection and are the first step into future oriented urban development. The Integrated and Area-oriented Approach proposed by CityChlor are a contribution to tackle this challenge.

These measures can be both, management tools as well as instructions for processing of Brownfield development. An Integrated Urban Planning approach forms the planning tool for provident planning already considering contaminations, its challenges, costs and therefore integrated development procedures. At the same time it considers the Brownfield within its neighbourhood, its strengths and opportunities due to the comprehensive understanding of its weaknesses and threats.

The research has shown that the boundary conditions in Stuttgart for the implementation of the Integrated and Area-oriented Approach are very good. The quality of the presented measures however highly depends on their application. Perspectives of institutions, which are involved in Brownfield development, are often different. From the perspective of urban planning, the focus is on urban development and urban regeneration. From the perspective of land management the focus is on the provision of sufficient land to satisfy demand. In Stuttgart contaminations are actively considered just in case of harming influence on the environment. One can discuss about a passive role of contaminations in the field of urban development. This is despite the knowledge that contaminations have a severe impact on the marketability of sites and therefore on the success of urban development. In the cores of the study the active role of contaminations have been discussed by understanding the opportunities of how contaminated sites and their required processing can be integrated in the urban planning and development procedure.

It has been shown that the process of Brownfield development comprises the four components of sustainability: Remediation (environmental issue), revitalization (social issue), reintegration (economic issue) and regulatory and administrative processes. The economic issue is adherent to all. Derelict, vacant and underused land has to be redeveloped for urban growth, for the improvement of environmental quality or to attract investments (revitalization).

Existing contaminations have to be cleaned up (remediation) and the land has to be brought back to the economic market cycle (reintegration). Therefore comprehensive approaches are adopted. The research results have shown, that the benefit of comprehensive approaches has three contributions: The support for inner-urban development by active coordination and pushing forward of complex projects, the contribution to qualitative improvement of the urban environmental quality and finally the reduction of costs for the public encouraging and involving the private sector.

One recognizes that the Integrated and Area-oriented Approach supports the three components of sustainable development, which are the social issue considered by urban planning, the environmental issue considering the environmental aspect of urban development and the economic issue reduction of costs and the attraction of the market. The Integrated and Area-oriented approach itself presents the fourth component of sustainability, which reflects the process quality or in other words the regulatory and institutional issues.

Stuttgart has already large experience in the field of new management approaches for inner-urban development projects through the participation in various research and pilot projects. The challenging task should be then to transfer this experience into a routine procedure.

The municipality has already experts in their various offices for interdisciplinary cooperation who also could pass their knowledge to colleagues. But of course interdisciplinary cooperation is demanding, time consuming, has to actively initiate processes and therefore often results in additional work, which causes a dilemma. Already highly engaged employees, even motivated are not able or willing to bear additional tasks. Hence the implementation of comprehensive procedures like the Integrated and Area-oriented approach has to be a political topic. Like several researches have already shown comprehensive procedures are worth to be applied due to their accelerating character for inner-urban development. Then it is not any more the question if they should be implemented but how they can be practicable and efficiently being implemented.

What can be clearly recognized observing the administrative attitude in Stuttgart related to the aspect of inner-urban development is the influence of the legally binding preference for inner-urban development. The same is true for the focal points stated in the „Inner-urban development concept“ STEK. Both serve as a framework on which everything is oriented. Large and highly developed cities like Stuttgart need diverse administrative structures. But it has to be understood that good governance and administration means active participation in the diverse urban processes. Active participation does not mean to increase the number of laws and regulations. Active has to be understood in the sense of provident and holistic acting because interrelations are best understood on high planning levels.

Participation in local, national and international funded research projects in the various fields like among others mobility, urban district management, environmental clean up, Brownfield development etc., is important to actively check new procedures and tackle specific problems existing in the city. To keep the city a prosperous and progressive city gained knowledge has to become a routine procedure in administration. This requires either additional employees or an adequate structure, which supports interdisciplinary cooperation. Like for the preference on inner-urban development the initiative has to come from the politics. It has to be clearly stated that interdisciplinary and cooperative procedures are politically desired and also supported by financial means.

In the field of public investments many researches have already proved that public investments motivate multiple private investments. Similarly one additional employee deployed at the right position and supported by desired more flexible structures and interdisciplinary procedures can reduce public costs at a much higher level, i.e. costs for remediation of contaminated sites. Benefits of an interdisciplinary approach could have been already recognized during the research work for this paper. Existing data from research projects and information about similar challenges of the neighbouring development projects could be applied for the Pilot Site of CityChlor.

The EU project CityChlor proposes the Integrated and Area-oriented Approach to tackle all problems arising for the development of small sites due to contaminations with CHC. The proposed measures should be applied for a Pilot Site in Stuttgart-Feuerbach facing these problems on the one hand complex contaminations of soil, groundwater and indoor air and on the other hand due to high remediation costs lacking interest of investors. The Integrated and Area-oriented Approach, applied on the administrative level also should contribute to promote private sector participation by improving the economic viability of these sites.

In the theory part of this research the A, B, C model has been presented as a conceptual model to categorize Brownfields according to their marketability. Later on several criteria for the evaluation of land marketability have been identified and have been grouped under Regulation and Administration, Market Value, Reclamation Costs and Risks.

Applying these criteria it has turned out that the Pilot Site can be categorized as a C-site, which is due to severe contaminations and therefore high remediation costs exceeding the current Market Value of the site. Development of C-sites has to be driven by public initiative. A precise SWOT Analysis carried out on macro, micro and site level has identified in spite of everything many strength and opportunities. Scenario Planning should then carry out benefits of the Integrated and Area-oriented Approach applied on the Pilot Site. Three scenarios have been compared. Scenario 1 has been determined as the base scenario. It was assumed that the current status of the site continuous unchanged. For Scenario 2 the Integrated Approach has been applied while for Scenario 3 both, the Integrated and Area-oriented Approach have been employed. The final evaluation of all three scenarios according to their marketability applying the assessment scheme carried out in the theory part has shown that the marketability of Scenario 2, just applying the Integrated Approach already could lead to a strong increase of marketability. For this scenario several bottlenecks remained indicating that not yet all problems could have been tackled. The application of both measures combined, the Integrated and Area-oriented Approach in Scenario 3 could increase the marketability in comparison to Scenario 2 and all previously examined bottlenecks could have been eliminated. For the scenarios the current conditions for inner-urban development with perfect application of the Integrated and Area-oriented Approach had been assumed.

The presented results strongly base on already existing policies and procedures applied for inner-urban development in Stuttgart. However this research identified that these procedures do not actively consider small, contaminated sites like the Pilot Site. This is due to lacking „suffering“ caused by the site resulting in missing public awareness. Nevertheless, contaminations have to be cleaned up and the costs have to be paid, often by the public.

The research has also shown that the application of the Integrated and Area-oriented Approach can be based on well-established instruments supporting inner-urban development in Stuttgart. As a result some recommendations for the application of the proposed measures shall help to come to a routine procedure for inner-urban development.

Contaminations have to be considered actively in urban planning and development procedures. Necessary data already exists and just has to be visualized as it has been demonstrated in the study. This implies all contaminations primarily known for public properties. As shown, experts of different fields and therefore different perspectives work together in the field of inner-urban development. Specialist data therefore has to be processed in a very well understandable way for everyone. Complex information especially about contaminations has to be presented in a very simple way e.g. by using clear colours for prioritization and/or

letters for categorization. The complexity of development of contaminated Brownfields demands interdisciplinary cooperation, within the municipalities and together with representatives from the private sector. Participating in research and pilot projects, employees in the municipalities gained experts knowledge. This expert knowledge has to be spread among the offices to achieve awareness of specific topics. In addition the application has to be trained including the usage of the common municipal data management system SIAS. Finally it is of utmost importance to understand that behind the „borders“ of a specific task starts another land. And this land might have influences on my „land“. Therefore tasks have to be framed with “permeable borders”. This directly can be turned into practice being applied on the Pilot Site. The several actions taking place in the surrounding of the Pilot Site demand an integrative and area-oriented procedure. This is not just a benefit due to reduced costs but it is even more a strong contribution to the city.

Complex problems need comprehensive approaches to find sustainable solutions. Integrated procedures are the administrative approach for sustainable urban planning and development. The Integrated and Area-oriented approach implemented on the urban and the project level applied on both, administrative and planning procedures can therefore be a strong contribution to future oriented development of cities.

It is needless to say that good solutions for site and space require a comprehensive dataset, respective legal instruments, public guidance, motivated authorities and much creativity. Creative and unexpected solutions are often the result of interdisciplinary work, which also includes public participation. It is last but not least also the mindset, which makes the difference, respect, understanding and the appreciation of the opposite.





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13 Appendix

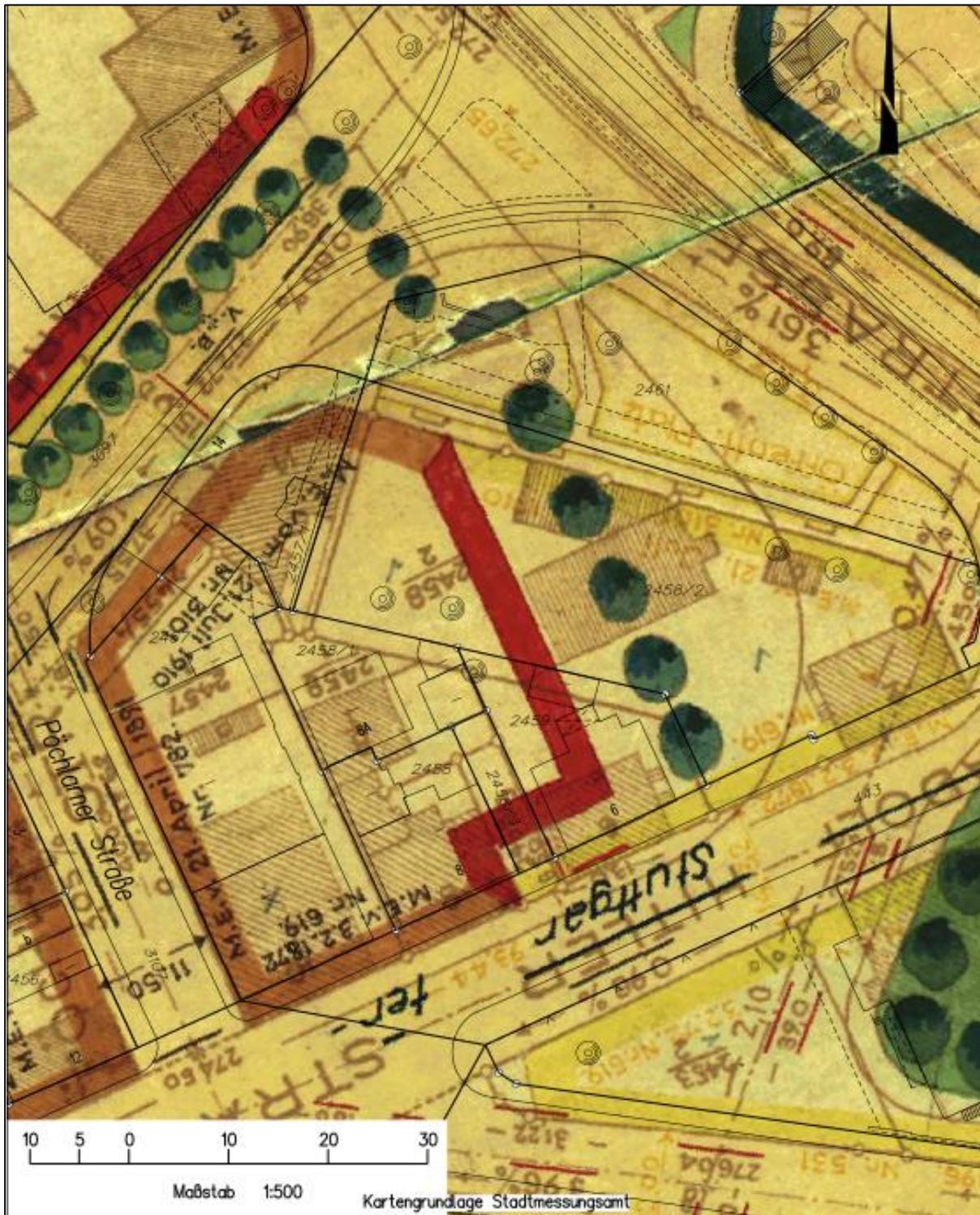
Annex 1

Bereich des Angebots	Leistung (Art der Beratung oder Förderung)	Name des Angebots	Beschreibung
Städtebauförderung	<ul style="list-style-type: none"> ■ Städtebauliche Entwicklung in Vorranggebieten der Stadterneuerung ■ Beratung ■ Förderung: Bundes- und Landesmittel (60%) sowie Kommunen (40%) 	Bund-Länder-Sanierungs- und Entwicklungsprogramm (SEP)	Förderung von Sanierungs- und Entwicklungsmaßnahmen in förmlich festgelegten Sanierungsgebieten.
		Bund-Länder-Programm Soziale Stadt (SSP)	Förderung für Stadtteile mit erheblichen Defiziten bei Sozialinfrastruktur, baulichem Bestand, Qualität des Wohnumfeldes und Umweltsituation.
		Landessanierungsprogramm (LSP)	Förderung von Sanierungs- und Entwicklungsmaßnahmen zur städtebaulichen Erneuerung in förmlich festgelegten Sanierungsgebieten.
		Bund-Länder-Programm Stadtumbau West (SUW)	Förderung der Herstellung nachhaltiger städtebaulicher Strukturen in Gebieten mit erheblichen Funktionsverlusten.

Bereich des Angebots	Leistung (Art der Beratung oder Förderung)	Name des Angebots	Beschreibung
Wohnbauförderung	<ul style="list-style-type: none"> ■ Schaffung von Wohnraum für Familien, Paare und Alleinerziehende mit Kindern ■ Beratung ■ Förderung 	Familienbauprogramm	Gefördert werden Neuschaffung und Erwerb bestehender Familienheime und Eigentumswohnungen durch zinsgünstige Darlehen aus dem Landeswohnraumförderungsprogramm, auch städtischer Baukostenzuschuss.
		Preiswertes Wohneigentum	Gefördert werden Neuschaffung eigengenutzter Familienheime und Eigentumswohnungen durch verbilligte städtische Grundstücke und durch zinsgünstige Darlehen aus dem Landeswohnraumförderungsprogramm.
		Sozialer Mietwohnungsbau	Gefördert wird die Schaffung von Mietwohnungen zu Gunsten von Haushalten mit geringem Einkommen durch Neubau, Erweiterung, Aus- und Umbau.
		Mietwohnungen für mittlere Einkommensbezieher	Gefördert wird die Schaffung von Mietwohnungen zu Gunsten von Haushalten mit mittlerem Einkommen durch Neubau durch städtische Bereitstellung verbilligter Grundstücke.
Städtebauliche Entwicklungsplanung	<ul style="list-style-type: none"> ■ NBS (Kartierung der Innenentwicklungspotenziale) ■ Testplanungen ■ Beratung und Förderung 		Erhebung und Darstellung baulicher Brachflächen mit Entwicklungspotenzialen. Konkretisierung der Potenziale.
Altlastenbearbeitung auf kommunalen Flächen	<ul style="list-style-type: none"> ■ Untersuchung und Sanierung kommunaler Altlasten (hier: beim An- und Verkauf von Grundstücken) ■ Beratung und Förderung 	Kommunaler Altlastenfonds Baden-Württemberg (FrAl)	Förderung der Erhebung, Untersuchung und Sanierung kommunaler Altlasten bei hoher Umweltgefährdung.
Altlastenbearbeitung bei städtischem Interesse	<ul style="list-style-type: none"> ■ Untersuchung und Sanierung von Altlasten (bei städtischem Entwicklungsinteresse) ■ Beratung und Förderung 	Städtischer Altlastenfonds Stuttgart	Förderung von Untersuchungen und Sanierungen städtischer Flächen oder Untersuchungen im städtischen Interesse (sofern keine Förderung nach FrAl).
Baulücken	<ul style="list-style-type: none"> ■ Förderung ■ Beratung der Eigentümer 	Baulücken - Mobilisierung von Baulandreserven	Förderung der Revitalisierung von Baulücken durch Informations- und Beratungsangebote des Amtes für Stadtplanung und Stadterneuerung zu Bau-, Verwertungs- und Finanzierungsmöglichkeiten, Investorensuche, Mediation mit Eigentümern/Verwaltung.
Wirtschaftsförderung	<ul style="list-style-type: none"> ■ Beratung 	Bestandsentwicklung und Ansiedlung	Beratung von Unternehmen in Standort- und Planungsfragen, Hilfestellung bei Genehmigungen und Verfahren aller Art, Hilfe bei der Standort- und Vermarktung städtischer Gewerbegrundstücke.
Beratung bei Baumaßnahmen	<ul style="list-style-type: none"> ■ Beratung 	Bürgerservice Bauen	Auskünfte und Beratung zu Grundstücken, Baugenehmigungen, Verfahren, Altlasten.

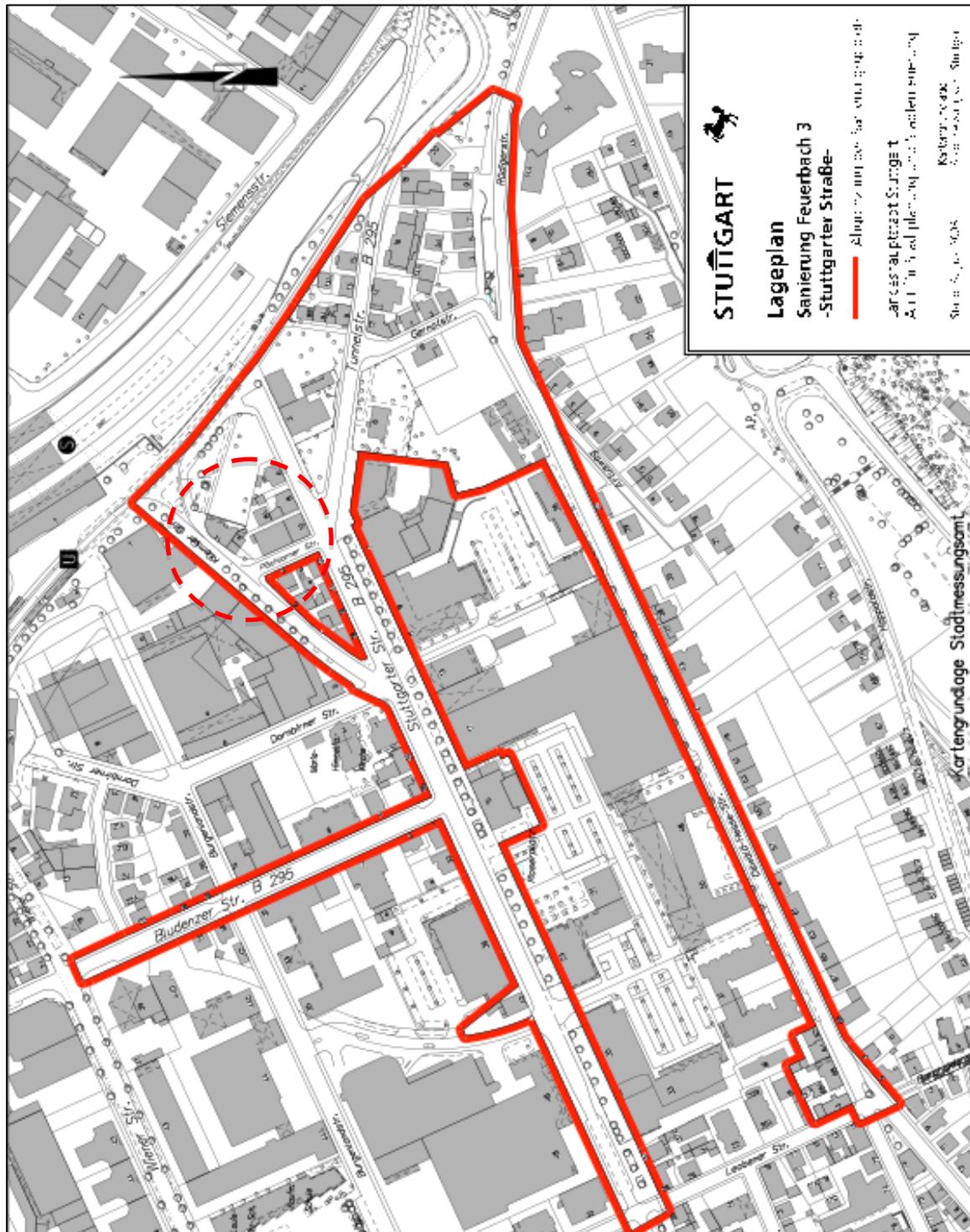
Annex 1; Funding programs and consulting services offered by the city of Stuttgart; Source: (KMU, 2009, p. 11)

Annex 2



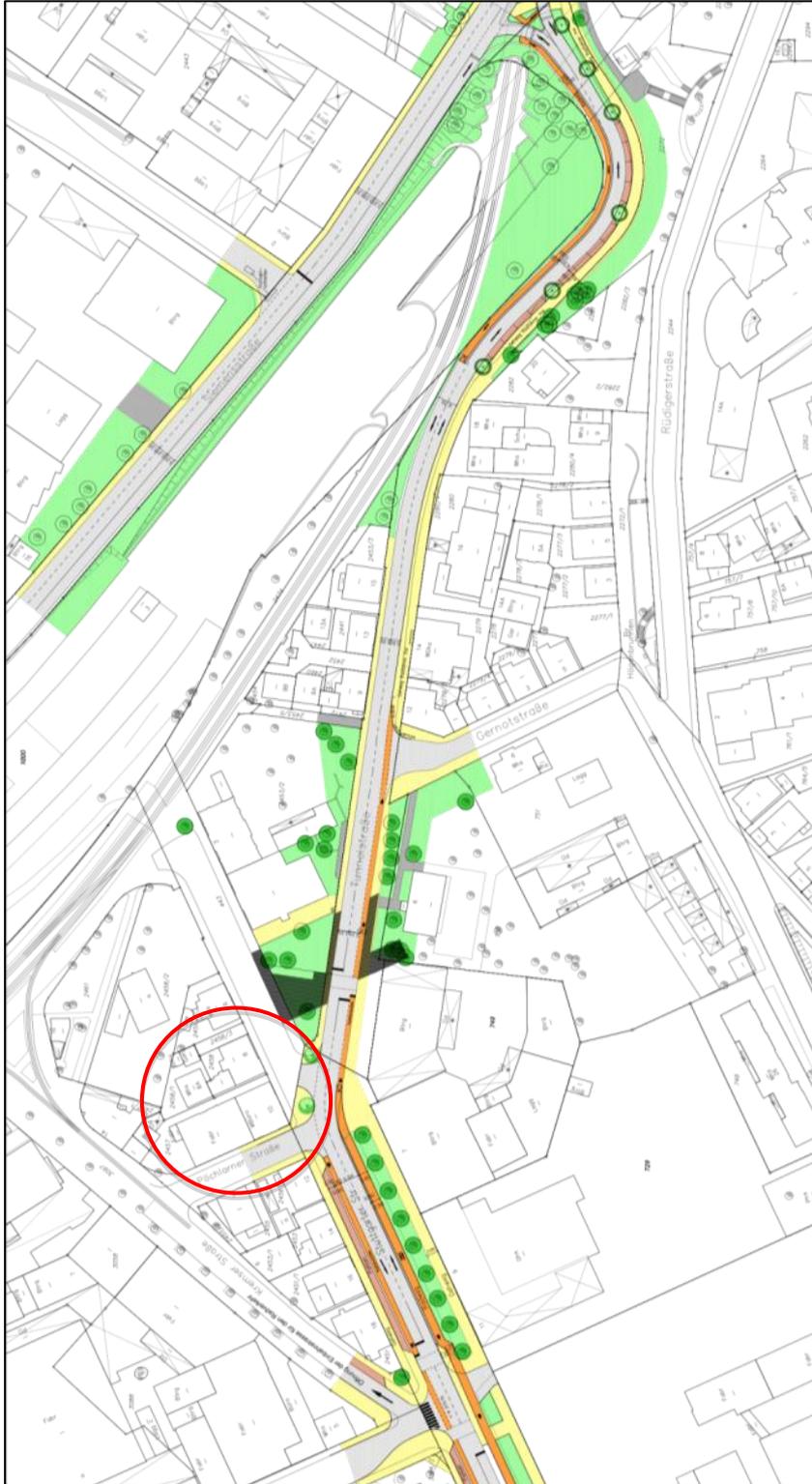
Annex 2; Current implementation Plan Pilot Site S10 „Baustaffel 3“; Source: (LHS Stuttgart, 1938)

Annex 3



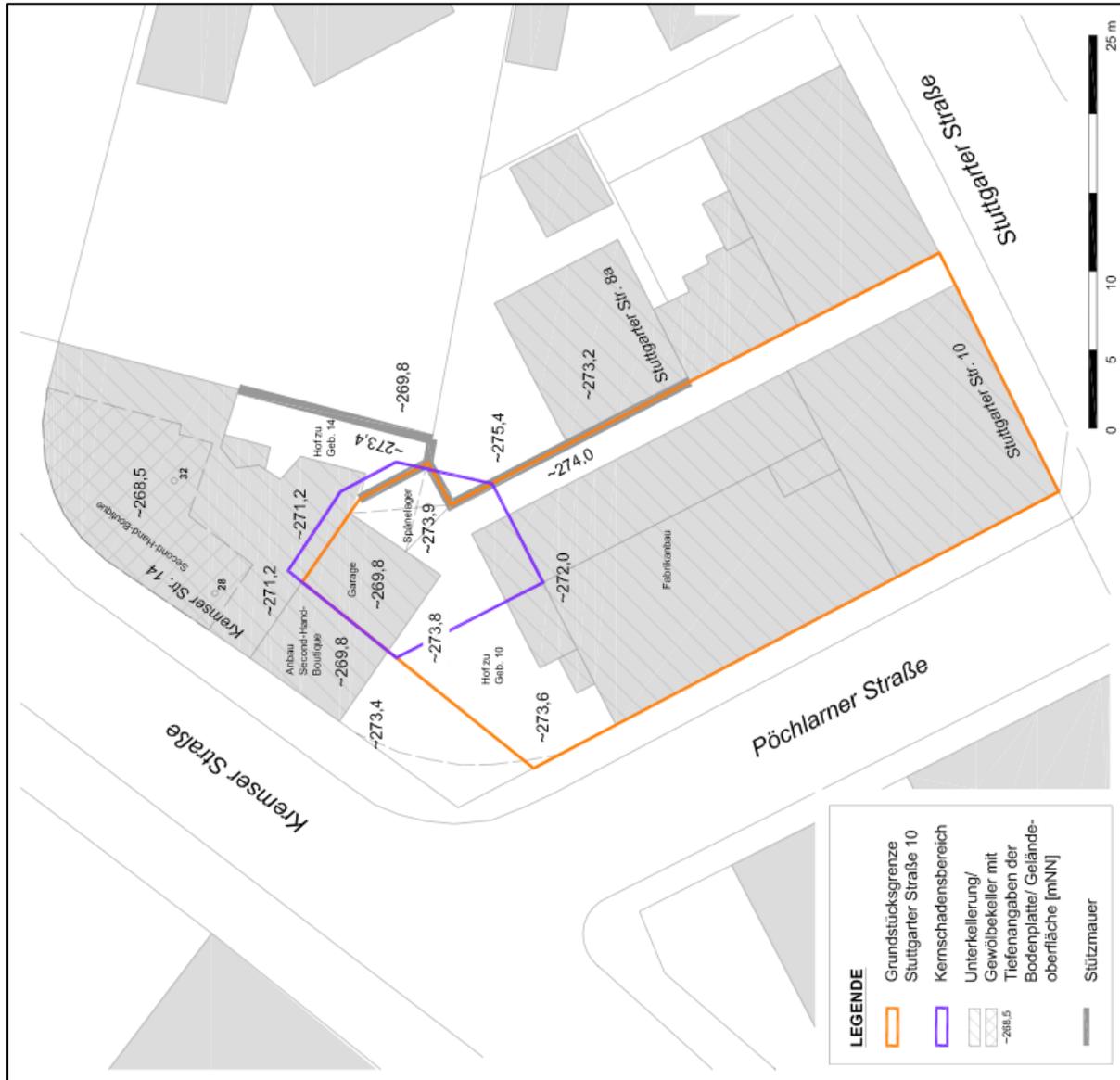
Annex 3; Urban Renewal Area „Stuttgart-Feuerbach 3“; Source: (LHS Stuttgart (e), 2008)

Annex 4



Annex 4; New traffic routing B295 Stuttgarter Straße, Stuttgart-Feuerbach; Source: (LHS Stuttgart (c), 2004)

Annex 5



Annex 5; Pilot Site with contaminated area; Source:(Arcadis, 2011)



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November 2012
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