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HOMBRE

"Holistic Management of Brownfield Regeneration"

D 3.3: Evaluation of test results from the Brownfield Navigator use in case studies

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Disclaimer

Summary

This report describes the results of using the Brownfield Navigator (BFN) in HOMBRE cases. Objective of the BFN is to provide better planning, by means of a more attractive communication technology that allows a more holistic appraisal of brownfield (BF) regeneration options and early stakeholder involvement. The BFN facilitates interactive stakeholder involvement, by visualising alternative development scenarios and regeneration plans, which enables stakeholders to design well balanced land use combinations that will meet planning objectives and ambitions (quicker, cheaper and more sustainable).

BFN

The BFN is divided in three modules (following the land management phases: anticipate change, plan the transition and check performance). Each module contains methodologies, tools, instruments developed within HOMBRE, and are called (BFN) items. Some general items (example library, note pad, map and sketching tool) are applicable in all management phases and are available in all BFN modules. The BFN is online available on bfn.deltares.nl.

Set up for testing

The BFN and its items were tested in workshops at different case studies (HOMBRE cases Genoa (Italy), Solec (Poland), Markham Vale (UK), and additional cases/sites: Rotterdam (The Netherlands)), Orléans (France), Meerane (Germany) and by stakeholders in Spain. Because BF redevelopment alone (make the transition phase) can take decades, the BFN could not be tested for the complete phase, let alone for the complete cycle on a case But because of the modular set-up of the BFN it was possible to test different BFN items, depending on the phase and dynamics of the case.

Test items in management phase “anticipating brownfield emergence”

The “anticipating BrOWnfield Emergence Tool” (BOWET) summarizes a methodology, including 4 steps and the concept of early warning indicators, to anticipate on brownfield emergence. This method helps to determine and incorporate early warning indicators to detect in time areas that may become brownfields. This method is assessed on feasibility and relevance by applying the method on two European towns in France and Germany. Conclusion was that it is possible to obtain modelling equations to predict brownfield emergence.

Test items in management phase “plan the transition”

The following BFN items were tested in different workshops and cases. This gave different recommendations for the items; however, all items were found useful and easily accessible.

- Map and sketching tool
- Vision, Ambition and societal demand tool
- Bioenergy tool
- Construction and demolition waste flowchart
- Technology train workshop
- Example library
- Brownfield Opportunity Matrix
- Brownfield Remit response tool

Evaluation of BFN

Stakeholders found the main advantage of the BFN: the easily accessible and understandable content and use of the BFN. What was considered as a point for improvement: the absence of a cost-item. Some valuation, relative or absolute, is a strong requirement for the users. Also some comments were made on the balance between general and site specific items. In many cases more site specific information is needed to be able to apply the items. However, this site specific data makes the BFN also less useable for different areas/regions/countries (e.g. costs are highly site specific, even within

member states of the EU). Also language was mentioned to make the tool more useable for the main target group: municipalities, in interaction with stakeholders. Currently, the tool and its items are in English.

General recommendation and future development is to focus on more specific versions on the BFN, for member states and maybe even for specific tasks within BFN redevelopment. A challenge is to spend more time on the checking financial viability and conformity of planning objectives with broader sustainability indicators. Integrating costs can also be a very useful aspect in a more specific BFN.

Contents

1 Introduction and background

1.1 HOMBRE project

The overarching aim of HOMBRE (Holistic Management of Brownfield Regeneration) is to develop new approaches to improve brownfield (BF) regeneration and prevention in terms of performance and sustainability in a holistic way. The goal is to show new opportunities for BF redevelopment to generate more value for private and public investors.
HOMBRE's strategic goal can be specified by the following research objectives:

- Better understanding why, how, where and when BF's are formed in order to avoid future BF's , in different areas in the EU and in three main fields: urban, industrial and mining areas,
- Better planning and more attractive communication technologies, that allow more for a holistic appraisal of BF regeneration options and early stakeholder involvement,
- Better operations, better implementation of state of the art technologies, and development of innovative technology combinations for more sustainable integrated BF regeneration,
- Better and more creative solutions for long-term land use of current and potential future BF's.

HOMBRE consists of different work packages (figure 1.1), from which WP3 focuses on the development of the Brownfield Navigator (BFN).

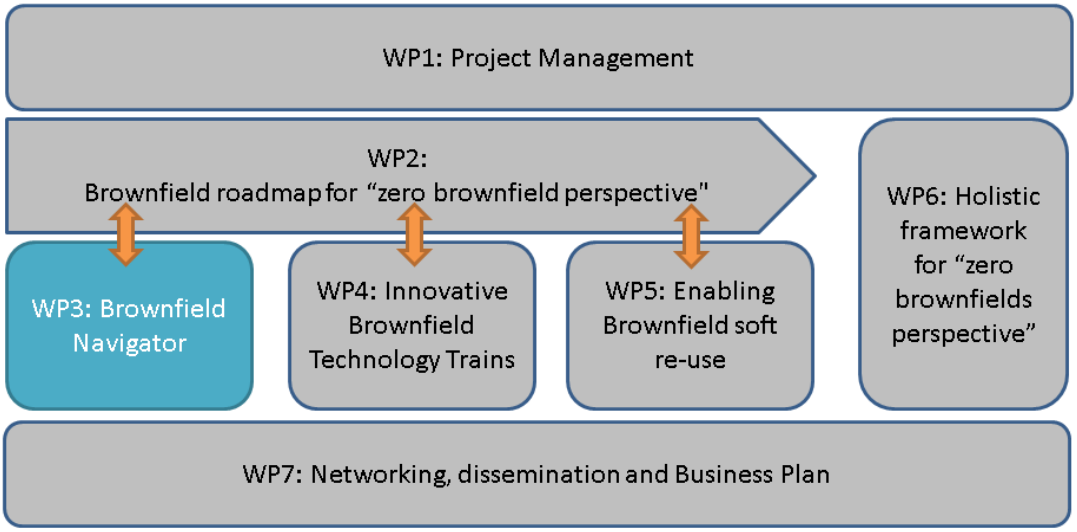


Figure 1.1 HOMBRE Work packages

The main objective for WP3 is to provide better planning and more attractive communication technology that allows for a more holistic appraisal of BF regeneration options and early stakeholder involvement.

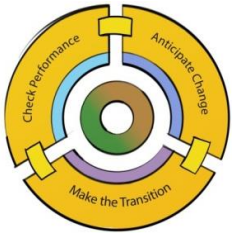
1.2 The Brownfield Navigator

Since BF sites are in most cases difficult to redevelop for many reasons, it is beneficial to identify at an early stage if a site is becoming a BF and how a particular BF site can be successfully regenerated. To choose the best regeneration strategies, technologies and approaches for BF regeneration, there is a need for more elaborate guidance and integrated decision making tools during the planning phase of a BF regeneration project, that will help stakeholders to holistically 'navigate' towards a successful regeneration project.
Following the Description of Work (DoW), the objectives of work package 3 Brownfield Navigator are to provide better planning and more attractive communication technologies that allow for more holistic appraisal of BF regeneration options and early stakeholder involvement. WP 3 consists of three tasks:

- Task 3.1.: Identification and integration of success indicators in DSS (D3.1 Decision support framework for BF regeneration Maring et al., 2013-I);
- Task 3.2. Development of the BFN, an interactive spatially based IT decision making tool (D3.2 BF Navigator software and procedure (Maring et al., 2013-II);
- Task 3.3 Testing of the BFN in case studies. In this task also adaptation and refinement of the software procedure is taken up, see text box 1.1 (D3.3 Testing and evaluation).

This report focuses on task 3.3 where the BFN is tested and evaluated in case studies…

1.3 Used BFN terminology

BFN term	Description
BFN	Brownfield Navigator, online available on bfn.deltares.nl
Modules	 The BFN follows the management phases of the land cycle as described in Van Gaans et al. (2014). The BFN has for each phase a module containing phase-specific items Figure1.1 The land management cycle (Graphic by JAM Visuals, HOMBRE Final Brochure, 2014)
Phase specific items	In each module, the user can find tools, methodologies, instruments that support the specific phase. These are called: items
General items	The BFN also contains tools, methodologies, instruments that can be applied during all phases of land management such as a map and sketching tool, example database, and reference database. These are general items

1.4 Reports aim and scope

This report gives an evaluation of test results from the BFN used in case studies.

Chapter 2 presents the set-up to test the BFN in case studies for the different management phases of in the land management cycle. The BFN or its items were tested on several occasions in different case studies. In chapter 3 the test results for the methodology developed for the management phase "anticipating brownfield emergence" using early warning indicators are given. Chapter 4 presents the results of testing different BFN items within the "planning and transition" management phase on sites in Genoa (Italy), Solec (Poland), Markham Vale (UK), Rotterdam (The Netherlands) and in Spain. Chapter 5 reports the recommendations, including future developments.

2 Set up of testing the Brownfield Navigator in case studies

The BFN covers different management phases of the land management cycle and therefore different phases of project planning that can last years or decades in practice. The HOMBRE cases all have a specific character; they are in different phases, have their own dynamics and their own regulations. Therefore it was not possible to test all items of the BFN on one case. Thereby, the development of the BFN and its items, which are also developed in other work packages in HOMBRE, was on-going during the testing period.

Therefore, testing was done 'organically': when and where possible. Some testing was combined with development of an item and the BFN itself (such as the 'anticipating emergence of BF with early warning indicators', chapter 3). In several stakeholder meetings, the BFN was presented and the attendees reflected their findings. On other occasions a single BFN item, or a few items were tested on a case in a workshop. This provided useful feedback to improve the item(s).

Because of the modular set-up of the BFN, this worked very well. The results combined gave a lot of insight in the possible use of the BFN and recommendations for future developments. The most elaborated test on items was done on the Genoa case. Note that testing of the items was also done in combination with other work packages. Therefore some of the results are more elaborated in other deliverables, in which case this report gives a reference to the proper documents.

In figure 2.1 the BFN items are show along the land management cycle. The yellow boxes indicate in which work packages the items were developed and pink boxes indicate which items were tested in which cases. Next to the HOMBRE cases, some items were also tested on cases outside the HOMBRE project (Rotterdam (Netherlands), Meerane (Germany) and a French case and Spanish cases).

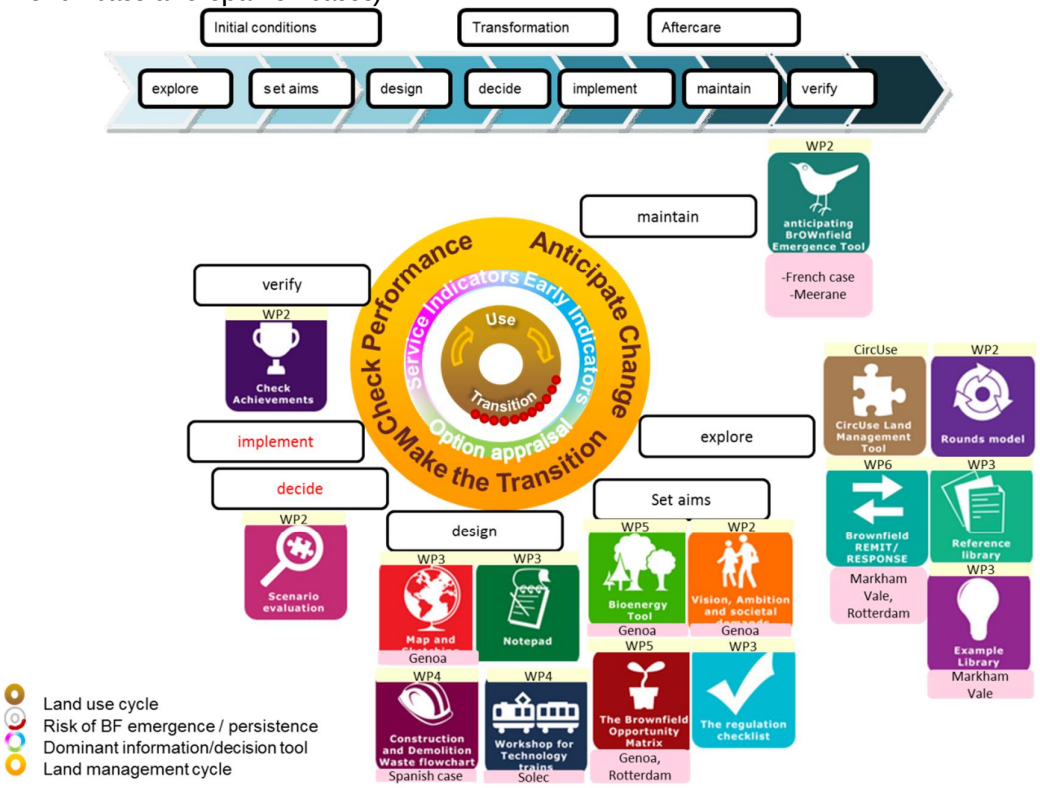


Figure 2.1 Items of BFN along the land cycle

For the use of the BFN and its items, a red line document and a manual (e-learning materials) are developed. They are available in the BFN (bfn.deltares.nl) and reported in Deliverable 7.2 “E-learning materials” (Wendler, 2014).

2.1 Module anticipating change within the BFN – link with previous work

One of the objectives of the HOMBRE project was to better understand why, how, where and when BFs are formed in order to anticipate and therefore try to act on preventing BFs formation. This phase is indicated in the HOMBRE Zero BF Framework, anticipating change.
Within HOMBRE around 40 early warning indicators (EWI) have been identified by literature review. They are considered to be generically useable (different Member States and sites) for brownfield emergence prediction. By monitoring them it is possible to anticipate to brownfield formation and identify related problems at an early stage (Ellen et al., 2013-I). Data availability and monitoring of such indicators is assessed by Ellen et al., 2013-II.

A method is set up that enables to determine and incorporate EWI. It is a four step approach; based on retrieving data from various sources (public sources, city officials, etc.), assessing brownfield potential for specific indicators, modeling an overall brownfield potential for various urban districts and visualizing maps of potentials. The “anticipating BrOWnfield Emergence Tool” (BOWET) explains the methodology. This is accessible from the BFN in the anticipating change module.

The tool is tested on feasibility and relevance on two European towns in France and Germany. Conclusion: it is possible to obtain modeling equations to predict brownfield emergence. A prototype mapping software was also developed in parallel to visualize predicted potentials of brownfield emergence for both case studies. How to apply the method, model brownfield potential and use a visualization tool are explained in more detail in chapter 3.

2.2 Module plan the transition within the BFN – link with previous work

Next to better understand why, how, where and when brownfield are formed in order to anticipate and act on preventing brownfields formation, Hombre also aims at:

- Better planning and more attractive communication technologies, that allow more for a holistic appraisal of BF regeneration options and early stakeholder involvement,
- Better operations, better implementation of state of the art technologies, and development of innovative technology combinations for more sustainable integrated BF regeneration,
- Better and more creative solutions for long-term land use of current and potential future BF’s.

The BFN is meant to facilitate interactive stakeholder involvement, which helps to visualize planning scenarios and eventually aid in redeveloping a BF. The visualization aspect of the BFN is considered very important as well as stakeholder engagement, including stakeholders with a nontechnical background. At first, it was envisaged that the BFN addressed setting up an opportunity and feasibility plan. However, it was chosen not to include them, as their content and lay out differ for each BF site. The items that are included in the BFN do contribute to set up these plans and enable to make the transition.

The following items were tested, and although recommendations differed, the items were valued useful:

- Map and sketching tool
- Vision, Ambition and societal demand tool
- Bioenergy tool
- Construction and demolition waste flowchart
- Technology train workshop
- Example library
- Brownfield Opportunity Matrix
- Brownfield Remit response tool

2.3 Module check performance within the BFN – link with previous work

This module focuses on "check the performance": the financial viability and conformity of planning objectives with broader sustainability indicators. It is linked to the item Vision, Ambition and societal demand tool (in the "plan the transition" phase), where ambitions for the redevelopment project are set. This item is not tested in the project, because none of the cases were in this phase.

3 Test results from the Brownfield Navigator use in case studies: Anticipating brownfield emergence using early warning indicators

3.1 Introduction

BFs may result from changing industry and development patterns in various regions. The loss of industry, resulting in unemployment, and the reluctance of new investors to take on the technical difficulties and liabilities often associated with BF sites can affect the economic prosperity of the region, particularly in urban locations.

It is important to anticipate if an area has a potential for brownfield emergence, so that effective actions can be taken before negative consequences have already had their effect. This raises the following questions:
Would it be possible to predict and map the potential of brownfield emergence in any urban area in Europe? Would it be possible to identify specific zones which have the highest potential of BF emergence within an urban area? Can a generic approach for the study of brownfield emergence potentials be developed? The HOMBRE project has tried to answer these questions through a specific research study.

This section details the answers to these questions gained from the testing of the applicability and relevance of HOMBRE early warning indicators. These indicators presumably can help local authorities and urban planners monitor and identify areas with a potential of BF emergence (see Deliverable D3.1, *paragraph 3.2.2 "HOMBRE module who is it for?"*) (Maring et al., 2013-II).

3.2 The HOMBRE proposed methodology for anticipating BF emergence

The HOMBRE project has developed a four step approach for the use of early warning indicators to identify the potential of BF emergence in various districts of a study area (as initially described in Deliverable D3.1, Appendix D (Maring et al., 2013-II)). The methodology is recommended for any urban planners/local authorities who are willing to anticipate on BF emergence. It is a generic approach which nevertheless requires specific adaptation to any of the European towns to which it may be applied, since they all have their local or regional specificities. The methodology of the tool is available from the "anticipating BrOWnfield Emergence Tool" (BOWET), within the BFN "anticipating BF emergence" stage. The four step approach (figure 3.1) is described below.

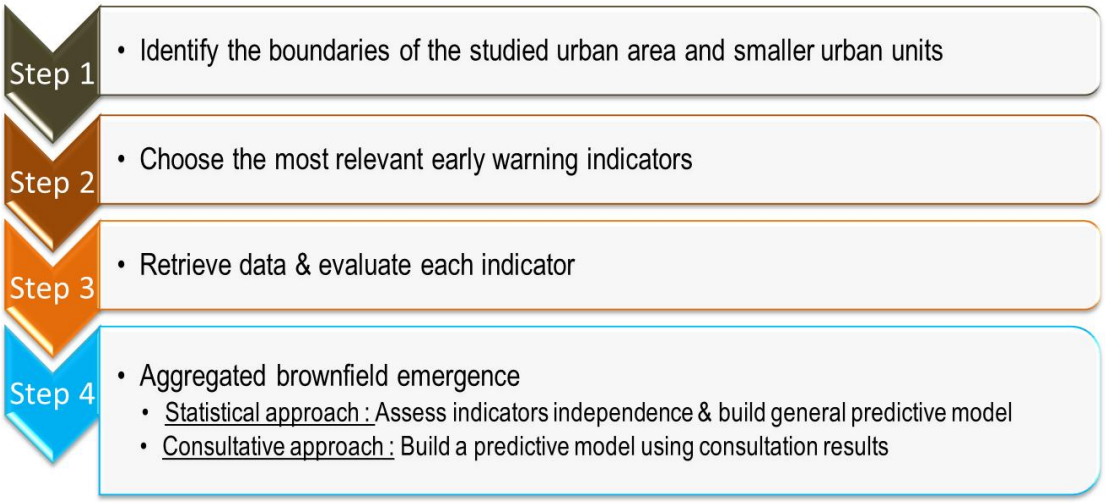


Figure 3.1 The HOMBRE four step approach for anticipating BF emergence

In step 1, it is important to identify the boundary of the studied urban area, decide on smaller urban units within the overall area. Step 1 also consists in obtaining a relevant base map for a GIS support tool.

During step 2, the most relevant early warning indicators that could apply to the whole studied urban area should be chosen. The HOMBRE EWI indicators cover criteria related to the three main categories of sustainable development, namely economic, social and environmental aspects. All kinds of BFs can be predicted with the use of the HOMBRE indicators, including industrial, commercial, residential, public amenity and military brownfields.

Step 3 consists of gathering the relevant data for the chosen indicators. The actions consist in gathering sound statistical data from a national dataset or other sources. Mapping data was also used in the case studies. Step three also requires the scoring of all early warning indicators within each urban unit in both case studies (i.e. scoring each explanatory variable).

The final step, step 4 proposes two complementary approaches which can be followed in parallel or separately: a statistical approach and a consultative approach.

The statistical approach refers to statistical and mapping data to obtain emergence potentials from data trends. This relies upon the objective analysis of historical data sets for a selection of early warning indicators and the assessment of which ones are the most likely to explain the present state of brownfields in a study area ("explanatory variable"). Mathematical regression analysis is then performed to propose a predictive model for BF emergence which should apply to the present situation. This model should identify a potential of BF emergence for each of the urban units within a studied area. It should then be tested and further extrapolated to identify areas which will potentially have more BF emergence in the future.

The consultative approach couples the evaluation of the data with the knowledge of local experts who may understand the trajectory of an urban area in more detail. This can help to develop a better understanding of the development of an area and apply an improved weighting system of the indicators. The difference to the statistical approach is that the consultative approach does not generate mathematical predictive equations but instead adapts a weighting system of the indicators according to the priority setting suggested by city officials.

It should be noted that the proposed approach cannot predict the emergence of BFs which arise from changes in political priorities or natural disasters. These types of events are too sudden and unpredictable to be properly accounted for, not to mention that there is limited relevant statistical information available on these topics. Instead, the approach takes into account data which has been collected and is comparable on the longer term to score the potential for brownfield emergence in cities.

3.3 Testing on two case studies

The proposed HOMBRE methodology (or BOWET tool) has been tested on two case studies, one in France and one in Germany. The statistical approach was tested on the French case and the consultative approach was tested in the German case. The main objectives of the test were to assess the feasibility and relevance of the statistical and consultative approaches and therefore the overall proposed methodology.

A prototype software program was also built in parallel to the testing to illustrate how to calculate and display BF emergence models. This program was used to visualize the BF potential modelling that resulted from the German and French case studies. This visualisation program which supports the overall approach was needed for the testing as it was considered particularly helpful for consultation sessions.

The testing is described below in details for both cases. It is also presented in a demonstration film[1].

3.4 French case study

As defined by the first step of the overall BOWET approach, the agglomeration boundary of the city being considered was chosen for the French case study.

The smallest geographic units of the national statistical institute, known as the IRIS, were chosen as urban units. Statistical data is available to the public free of charge for each of these units. There are a total of 115 IRIS or urban units for this case.

[1] ftp://ombre:brownfield@ftp.brgm.fr/HOMBRE_demo_v0-2.mp4

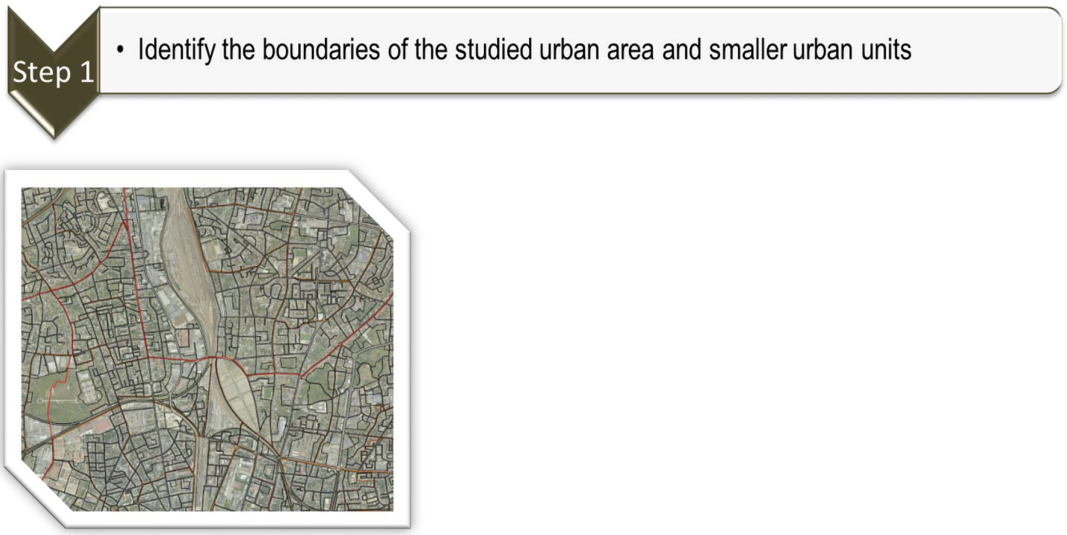
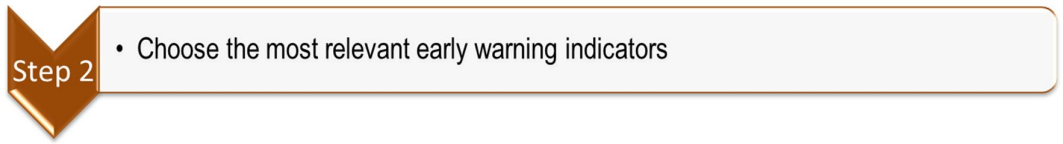


Figure 3.2 Example of delineation of the Urban Units of the French case



The study then looked into which of the HOMBRE early warning indicators were most suitable to explain BF formation for the existing BFs in the French agglomeration. One way to assess the relevance was to look into the causes of emergence for the existing BFs within the agglomeration. Despite the fact that it was difficult to retrieve information on various causes, this review resulted in a specific list of indictors that is relevant to the studied area.

25 indicators were identified for the French case study related to all types of BF emergence (see figure 3.3, table 3.1). These 25 indicators were seen generic as they could have predicted different types of brownfields for the case study (industrial, commercial, residential, military, *etc*.). The detailed list of indicators is presented in Appendix A

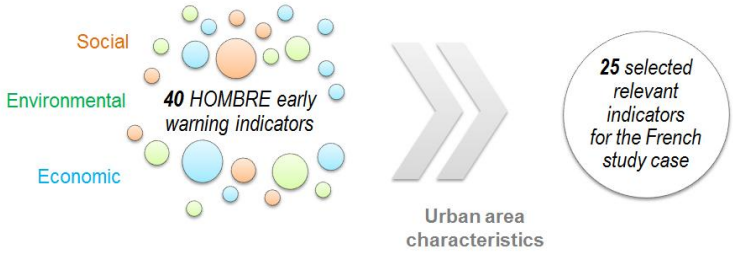
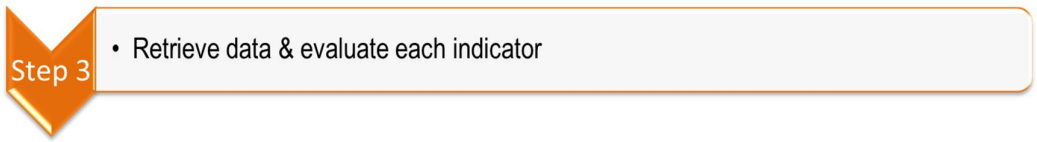


Figure 3.3 From 40 to 25 indicators

Table 3.1 Summary of the 25 initially selected indicators for the French case

Category	Sub category	Indicator title
Economic	Land use and land occupation	Percentage of area under specific land use/specific sector
		Number of operating installations for a specific sector
		Number of newly operating installations for a specific sector
		Survival rate for industries over a 5 year period - undifferentiated by sector
	short term statistics regulations	Turnover of the industrial sector
		Turnover of the commercial sector
		Turnover of the service/transport sector
		Turnover of the administrative, teaching, social sector
	Pressure on land value	Discrepancies in overall land use within one urban unit
		Discrepancies when comparing main land use within one urban unit with main land use in adjacent urban units
		Land value
Social	Accessibility, mobility, operational efficiency	Time spent waiting due to congestion
		Connection to/availability of good public transport for local residents
		Distance to nearest highway
		Average time for accessing the nearest every day services from home
		Commuting time
	Obsolescence	Age of the buildings
		Needs for thermal improvements in principal living accommodation
		Well-being and comfort in housing
	Well being	Average age of inhabitants
		Percentage of already abandoned plots
Environment	Well being	Percentage of green area per inhabitant (m2/inhabitant)
		Perception of contamination
	Natural and industrial hazards	Natural and industrial hazards
Governance	national politics for military defense	Defense politics



Step 3.1 – Retrieve data for the 25 indicators

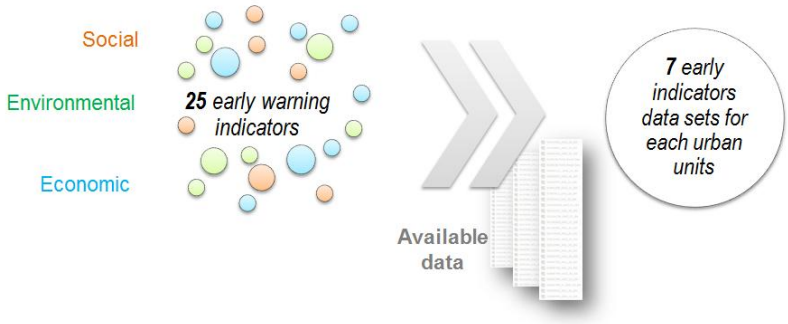


Figure 3.4 From 25 to 7 indicators

The public availability of statistical data needed to assess the 25 indicators was looked into. Database such as the INSEE, BASIAS[2] and the notary public information on land values were used for this case.

It was established that relevant data was available for only 7 indicators which could mainly predict the potential for industrial brownfield emergence. These indicators are presented in table 3.2 below. Specific definitions are provided in Appendix B.

Table 3.2 Summary of 7 selected indicators for the French case

Sub category	Indicator	Which data was gathered?
Land use and land occupation	Number of operating industrial installations	Evolution of the number of industries between 2009 and 2012 – For Each IRIS, the percentage of evolution between these dates was calculated. This required looking into 4 INSEE datasets
	Number of newly operating industrial installations	Evolution of the number of newly created industries between 2009 and 2012 – For Each IRIS, the percentage of evolution between these dates was calculated. This required looking into 4 INSEE datasets
	Existing brownfield area	Percentage of areas occupied by existing brownfields area for each IRIS (hectares of existing BF/hectares of total agglomeration); This required mapping the existing brownfields and identify their nature for the whole agglomeration– It was not possible to look into the past evolution of this indicator.
Pressure on land value	Discrepancies in overall land use within the urban unit	Only existing industrial BF were looked at. For each IRIS considered with residential as its main use, the ratio "number of industrial installations in 2012 versus the number of principal accommodation in 2012 was obtained. This required looking into three separate INSEE dataset. The past evolution of this indicator was not studied.
	Residential land value	The land value for residential development in euros per m2 was obtained for each commune within the agglomeration. This required looking into one national freely available dataset. The values are only available for 2014 The past evolution of this indicator was not studied.
Accessibility, mobility	Distance to nearest highway	Distance from the center of each IRIS to a selection of nearest highways running through the agglomeration – Considered as representing the situation in 2014 – It was not possible to look into the past evolution of this indicator.
Well-being	Perception of contamination	Number of BASIAS sites for each IRIS. This required looking into the number of potentially contaminated sites from the BASIAS national database; This dataset is not necessarily up to date with existing potentially contaminated sites. Therefore, no dates can be associated.

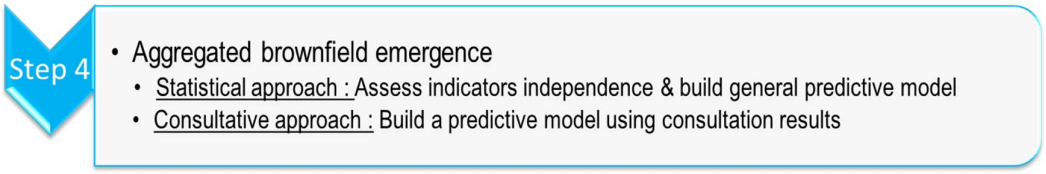
Step 3.2 – Evaluate each indicator

Discretization was carried out on all datasets using the equal frequencies principle, so that all the classes contain the same number of observations as much as possible. XLSTAT discretization tool was used (5 classes were chosen). A ranking from 1 to 5 was given to each IRIS and for each indicator as shown in table 3.3 below.

[2] INSEE is the French national institute for Statistics. BASIAS is the French national inventory of former industrial sites with potential contamination.

Table 3.3 Example of equal frequencies discretisation applied to the datasets of the 7 indicators

Urban unit (IRIS)	Operating industrial installation	Newly operating industrial installation	Distance to nearest highway	Perception of contami-nation	Existing brown-field land	Discrepan-cies in overall land use	Residen-tial land value
IRIS 1	2	2	5	2	5	5	5
IRIS 2	2	4	2	4	5	3	2
IRIS 3	1	2	2	3	5	1	1
IRIS 4	1	2	1	4	5	1	1
IRIS 5	1	2	1	1	5	1	1



Step 4.1 – Assessment of the independence of the indicators

Figure 3.5 Step 4 Aggregated brownfield emergence: step 4.1 Assessment of the independence of the indicators

A Principle Component Analysis (PCA) was then carried out on the 7 indicators and their associated datasets (using XLSTAT). PCA is one type of multivariate data analysis which in this case helped identify which of the 7 indicators were non-correlated factors (i.e. independent). The PCA is an iterative analysis. In the end, only 4 indicators were found to non-correlated or independent. These are described in the table below.

Table 3.4 The 4 non-correlated indicators

Sub category	Indicator
Pressure on land value	Discrepancies in overall land use within the urban unit
	Residential land value
Accessibility, mobility	Distance to nearest highway
Well-being	Perception of contamination

Step 4.2 – Build general predictive model

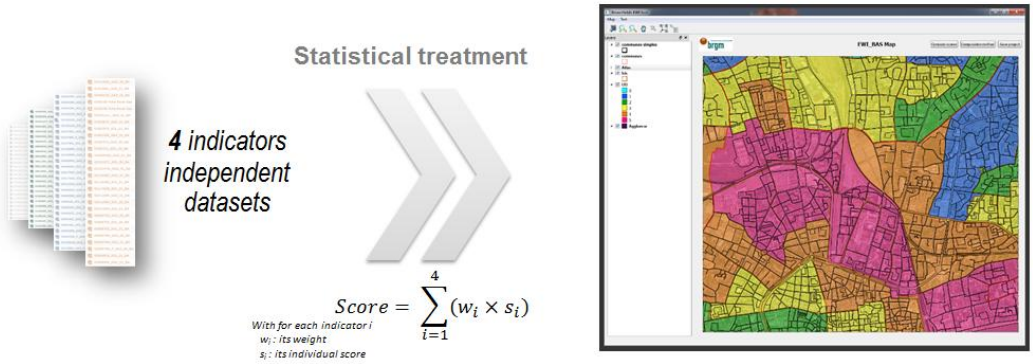


Figure 3.6 Step 4 Aggregated brownfield emergence: step 4.2 Build general predictive model

A linear regression was carried out on the datasets which allows the analysis of variance amongst the indicators and the presence of a BF in each urban units (see figure 3.7 below). A formula with specific coefficients for each of the four indicators resulted from the analysis. An overall value characterising the potential for BF emergence was obtained for each IRIS.

The percentiles of 33% and 66% were then used to organise all these overall values of potential into three classes. These three classes represent the three possibilities of emergence potentials, i.e. low, medium and high.

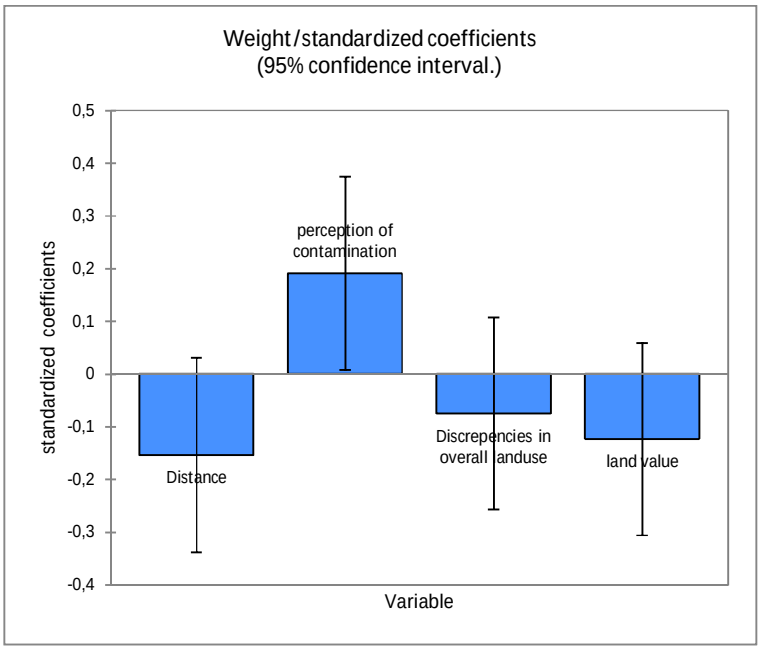


Figure 3.7 Standardized parameters plots – Linear regression analysis for the 4 remaining indicators versus the presence of industrial brownfield in each urban unit.

Step 4.3 – Assessment of the validity of the general predictive model

The validity of the results from the predicted potential equation were checked by assessing whether the model was right or wrong in each urban units. This test showed that 70% of the results appear to be correct. It has to be noted that this 70% is based on a hypothesis and not statistical analysis. The hypotheses for the validated model are presented in table 3.5 (these hypotheses are subject to interpretation).

Table 3.5 Hypotheses for the model

High potential for BF emergence within an IRIS	Industrial brownfield present in the IRIS	Model is correct
High potential for BF emergence within an IRIS	Industrial brownfield not present in the IRIS	Model is not correct
Medium potential for BF emergence within an IRIS	Industrial brownfield present in the IRIS	Model is not correct
Medium potential for BF emergence within an IRIS	Industrial brownfield not present in the IRIS	Model is correct
Low potential for BF emergence within an IRIS	Industrial brownfield present in the IRIS	Model is not correct
Low potential for BF emergence within an IRIS	Industrial brownfield not present in the IRIS	Model is correct

Step 4.4 Test and correction of the general predictive model

The final step of the statistical approach is to try to correct the prediction model. The overall brownfield emergence potential can be converted into shapefiles and visualised with a GIS support tool (e.g. such as the visualisation software developed during the project). By changing the score of individual indicators, the overall potential could change. Being able to observe such changes directly on a map in real-time may be very useful for the user, especially for discussions amongst local urban planners and local authorities in charge of urban planning. Feedback and discussions with local experts are needed to test and make any corrections to the general model.

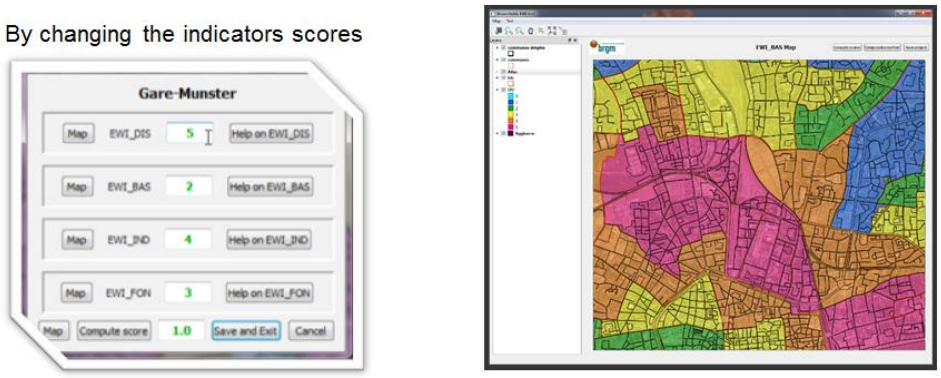


Figure 3.8 Test and correction of the general predictive model and conversion to shapefile

3.5 German case study

The German case study to test the HOMBRE early warning indicators was conducted in the City of Meerane, a smaller sized city with around 15.000 inhabitants which is located in eastern Germany in the Free State of Saxony. This city was strongly characterized by the important role played by the local textile industry which remained active in the city until German reunification. Since the 1990s, many industrial BFs have emerged in the city and a number of sites have been successfully redeveloped. It is expected in the future that the population will strongly decline. The Bertelsmann Foundation estimates that the city's population will shrink by about 20,5% by the year 2030 as compared to 2009 (Table 3.6). This is made up from a 0,9% loss caused by out-migration and a 19,6% loss due to natural causes.

Figure 3.9: satellite image of the City of Meerane (Source: Google Earth)

Table 3.6. Population Prognosis for the City of Meerane Source: Bertelsmann Foundation (2014)

Year	(Expected) Population
2009	16,270
2015	15,290
2020	14,530
2025	13,750
2030	12,940

Meerane will also experience an ageing of its population in the near future. The median age of the population is expected to rise by about ten years, from 49.3 in 2009 to 59 in 2030 (Bertelsmann Foundation). The composition of the population below 80 years old is expected to shrink in proportion while the age group "over 80" is expected to increase by about +62,3% (Bertelsmann Foundation, 2014).

In addition to these demographic developments, a new industrial district was created in the southwestern portion of the city to attract new industrial areas to the city. This district is a main marketing point for the location of new businesses and enterprises to the region.

The context of the City of Meerane makes the area suitable for the study of residential BFs that may arise due to a declining and ageing population. Also important for the city is the development of industrial BFs which may arise due to restructuring or other causes.

Step 1

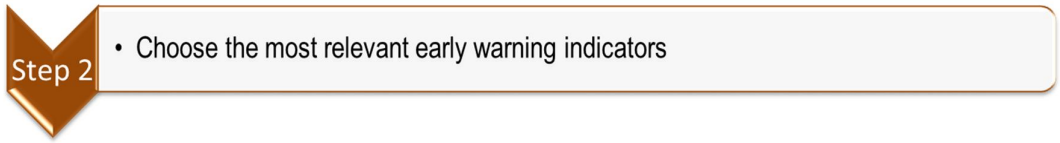
- Identify the boundaries of the studied urban area and smaller urban units

For the German case study, the inner city boundary was chosen as study area. The City Development Concept of 2007 (German: Stadtentwicklungskonzept) splits the City of Meerane into a total of eighteen administrative districts. Eleven of these districts cover the denser inner city area. To increase the effectiveness of the evaluation of the early warning indicators in Meerane, three inner city districts adjacent to one another and similar in composition were combined into one single district. Thus, a total of eight urban units were created for the early warning indicator evaluation in Meerane (Table 3.7 and Figure 3.10).
A GIS support tool was used to record and display the urban units as a basemap. These urban units can be imported from existing shapefile or drawn manually.

Table 3.7: The inner city administrative districts and their corresponding urban units for the application of the BOWET

Administrative District Number	Urban Unit Number (HOMBRE)	District Name(s)
1	1	Innenstadt
2	2	Schönberger Straße
3 4 5	3	Böhmerviertel Steile Wand Zwickauer Straße
6	4	Crimmitschauer Viertel
7	5	Schwanefeld
9	6	Remser Weg
10	7	Wohngebiet Süd-West
11	8	Gewerbegebiet Süd-West

Figure 3.10: Delineation of the Eight Urban Units of Meerane (indicated in red)



The study then looked into which of the HOMBRE early warning indicators were most suitable to determine BF formation for this case. The review resulted in a specific list of 16 indictors related to all types of BF emergence. Consultations with city officials helped identify the relevant potential early warning indicators in the City of Meerane. The indicators were then further evaluated for their suitability based upon available information. The 16 indicators are presented in Appendix C.

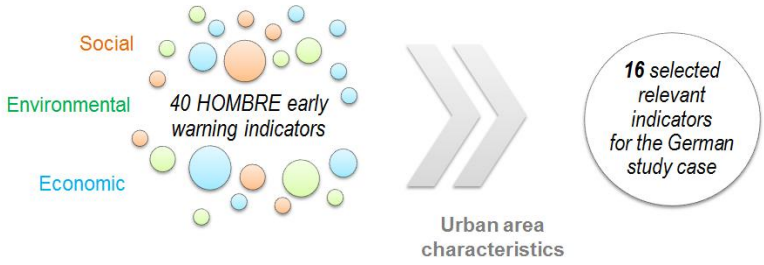
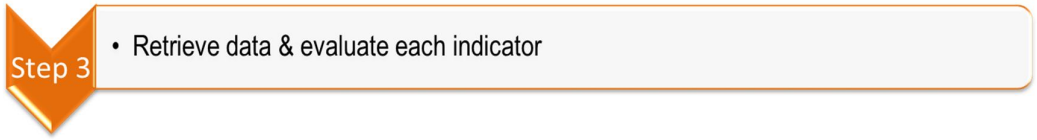


Figure 3.11 From 40 HOMBRE early warning indicators to 16 indicators



Step 3.1- Retrieve data for the 16 selected indicators

The study looked into the public availability of data related to 16 indicators. Official city documents and urban studies of the area formed the basis for most of the information gathered. Suitable information was available for 8 of the indicators and was mainly applicable to the prediction of residential brownfields. Since the city has a large industrial area present in the city, four of the eight identified indicators were also applied to study the potential of industrial BF emergence. In this manner, a more holistic view could be gained on the future perspectives of the city by considering the two different types of BF potentials. The collected data for the urban units in Meerane is presented in Appendix D.

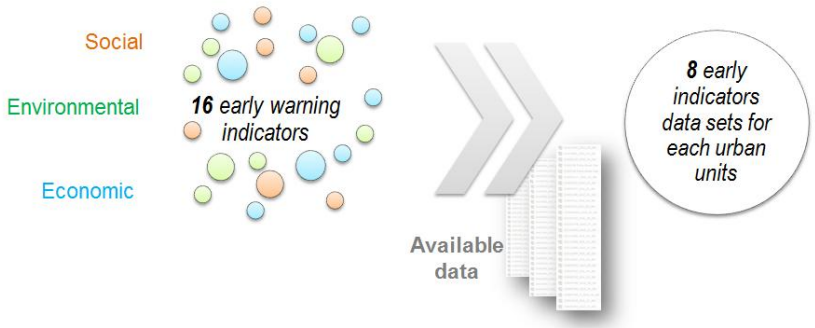


Figure 3.12 From 16 to 8 early warning indicators

Table 3.8 The final 8 indicators with available data for Meerane

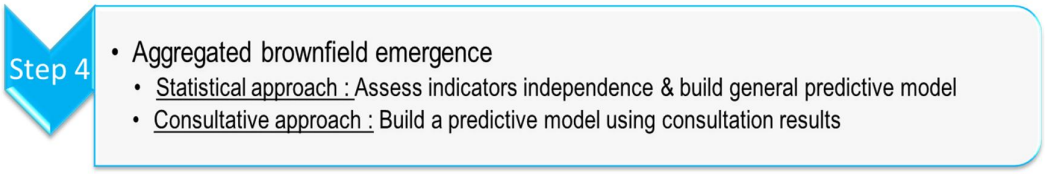
Indicator	Type of Brownfield Studied
Land value	Residential
Development of green space	Residential
Population change	Residential
Population composition by age	Residential
(Potential) land contamination	Residential and industrial
Amount of already abandoned plots	Residential and industrial
Distance to the nearest highway or train	Residential and industrial
Access to public transportation	Residential and industrial

Step 3.2 Evaluate each indicator (ranking)

A ranking from 1 to 5 was given to each urban unit and for each indicator based on available data as shown in table 3.9 below.

Table 3.9 – Example of score within each urban unit and each indicator

	Average access to local public transportation	Average amount of green space	Land values (€/m2)	Confirmed (or potential) amount of land contamination	Population decline
Innenstadt	5	4	2	3	2
Schönberger Straße	2	5	1	4	5
Böhmerviertel/Steile Wand/Zwickauer Straße	3	4	4	4	2
Crimmitschauer Viertel	3	4	4	5	3



Step 4.1 Evaluating an initial overall emergence potential

A weighting system was then proposed and adapted to each indicator based upon expert judgment and taking into account the context of the city. For example, the “average access to nearest highway or train” indicator was given a relatively low weight of importance with 5% due to the city’s relative smallness and the fact that the city can be crossed in about 15 minutes. The indicators related to the strong trends happening in the city, such as demographic change, were accordingly ranked higher with 20% to mirror the importance of these trends.

A weighted sum using the proposed weights and the previous ranking (rankings 1 to 5) was used to determine the overall emergence potential in each urban unit. The potential was calculated for residential brownfield potential and for industrial brownfield potential.

Table 3.10 Predicted potential of industrial brownfield emergence

	Weighted score of the indicators	RANKING
Innenstadt	*2,4*	MEDIUM
Schönberger Straße	*3,5*	LOW
Böhmerviertel/Steile Wand/Zwickauer Straße	*2,6*	MEDIUM
Crimmitschauer Viertel	*3,7*	LOW
Schwanefeld	*3,6*	LOW
Remser Weg	*2,2*	HIGH
Wohngebiet Süd-West	*2,3*	HIGH
Gewerbegebiet Süd-West	*4,3*	LOW

A draft version of the results was mapped out onto the urban units delineated for the project.

Figure 3.13 Basemap with provisional overall emergence potentials for the City of Meerane (where red represents high, yellow represent medium and green represents low potential brownfield emergence)

Step 4.2 Presenting the overall emergence potentials

The map showing the weighted score of each indicator was presented to members of the city administration in a consultation session. The session helped to adapt the weighting system of the indicators to the appropriate levels. In this manner, the local expertise of city officials was used to adapt the BOWET tool to the German case study.

For example, it was mentioned that many BF redevelopment projects have taken place in the city over the last decade. This heavy restructuring in the city has left many new green space plots in a patchwork manner throughout the city. The initial intent of the HOMBRE early warning indicators was to indicate when a district is becoming too dense and overcrowded to be desirable, which can potentially lead to the formation of brownfields. The case of the "development of green space" indicator in Meerane tends to show the opposite; areas with a high amount of green space development tend to be the districts which were or currently are undergoing strong restructuring. Thus, the hypothesis of the indicator must be adjusted for the special case to represent that a higher addition of green space can be an indicator for a higher potential of BF emergence.

Step 4.3 testing the approach in a consultation

The final step was to test the pertinence by engaging in constructive dialog with city administrators and officials. The discussions were focused upon the improvement of the BOWET approach and the proposed selection of indicators to adequately predict long term brownfield development. The expertise of the local experts helped to identify further possible problem areas, unique local specificities or other aspects of consideration which would not normally be discernible from city plans and local area studies.

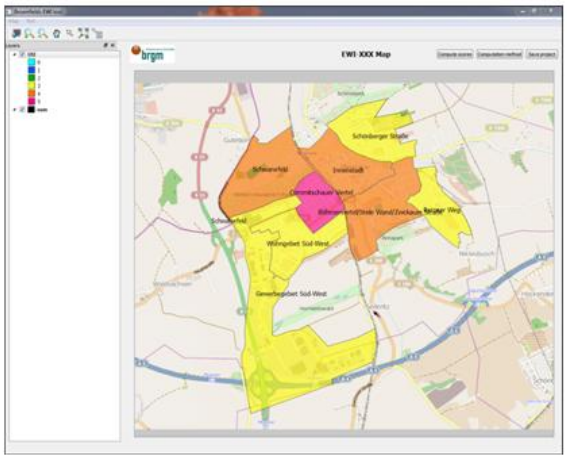


Figure 3.14 and 3.15: Discussion of the provisional results with city officials (left) and the provisional results of the German case study (right)

The mapping/visualisation software, which was designed during the HOMBRE project, has been applied to each case study to directly map the amount of potential for the emergence of brownfield as determined by the indicators.

For example, the adapted mapping/visualisation software to the German case offers a window where one can individually score the 8 early warning indicators for each of the urban units. The use of a visualisation program can be particularly useful during the consultation meetings required for the consultative approach, since direct changes of a score can be seen directly on the map.

3.6 Discussions on the results from both demonstration cases

The approach that has been applied to the French case study followed the proposed demonstration plan rigorously. The validation of the results was rather positive.

The statistical approach has many benefits: it is easily implementable if there is sufficient data available, predictive equations can be generated using online excel functions to generate brownfield mergence potentials and the results are objective in nature.

Some limits to this work in relation to the objectives that were set at the beginning of the project have to be pointed out.

- The research undertaken for the French case study could only be applied to industrial BFs as there was not enough available data to consider other types of BFs.
- The early warning indicators that could be looked into detail were specific to the local context. It was attempted to include more globally relevant indicators such as regional economic indicators in the analysis, but not enough relevant data was available which was provided at the urban unit scale.
- The prediction for the emergence of BFs for each urban unit in this demonstration is based upon the short term, in that its focus is laid upon the prediction of the existing brownfield locations that we are aware of today. A prediction for the near future could not be established based on the time series for which data could be retrieved (mainly between 2009 and 2011). It also has to be pointed out that the mapping of existing industrial BF does not take into account their date of emergence. This factor could have been taken into account for a more detailed statistical analysis.
- Finally, the overall demonstration for the statistical approach is based on just one case study and 4 indicators with a limited amount of data, meaning it is only possible at this stage to propose a prediction model for this case study which has many limits.

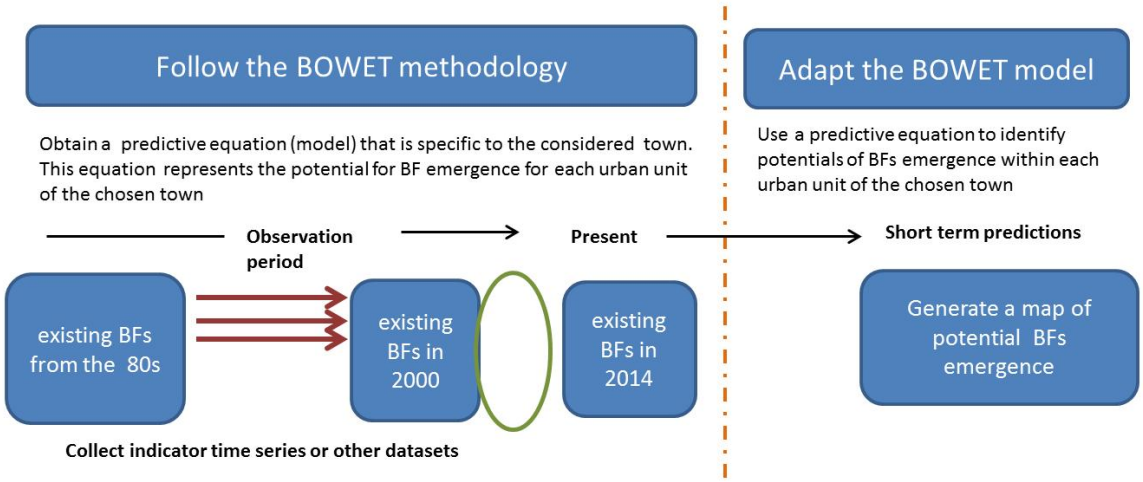


Figure 3.16: overall approach of the French application of the BOWET approach (the green circle represents the observation period for which data could be retrieved).

The German case also has its benefits and limits. One benefit includes the coupling of local knowledge into the evaluation of data for the more accurate portrayal of the local situations. Some of the limits of the German case include:

- It depended heavily upon the active engagement of city officials on the topic. Since these stakeholders do not always have the time and resources to consider such initiatives, it must be evaluated beforehand whether undertaking such an approach is desirable or not.
- In addition, the German case is based upon 8 indicators with limited data. The use of more data could help to fine tune the results.
- The German case study was not applied in a manner to anticipate the existing amount of brownfields in the study area.
- Finally, the consultative approach in Germany focused on studying the potential of future BFs on the long term. This means that the results will have to be verified with a controlling concept in the future.

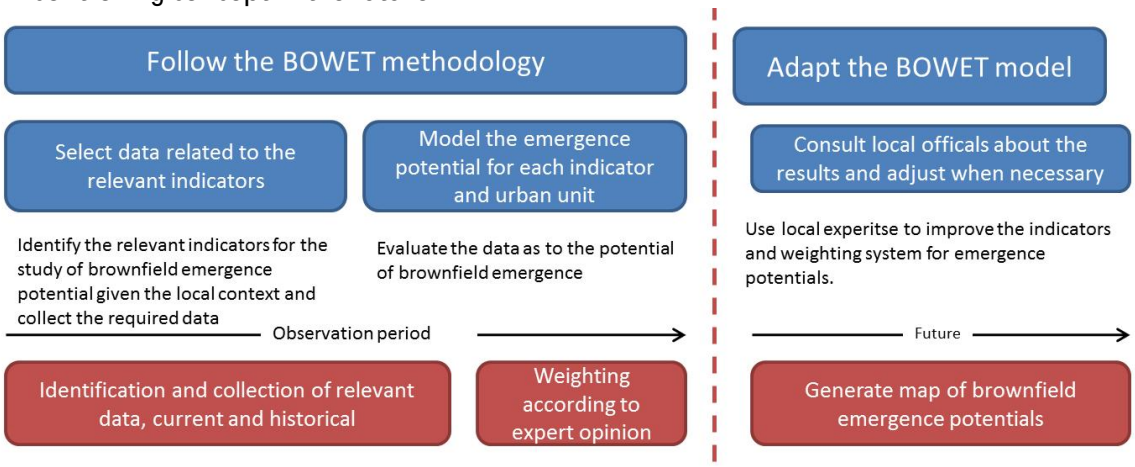


Figure 3.17: overall approach of the German application of the BOWET approach

3.7 Main conclusions from testing the approach

A generic approach to predict potential for BF emergence as stated in the initial objectives of the project has been proposed and tested on two European towns. The prediction for the short term and long term emergence potentials were obtained, with the limits of the results having already been stated in the previous section.

It is obvious from the demonstration results that it is possible to establish a generic approach (e.g. the BOWET) to evaluate the emergence potentials which takes into account local specificities and develops specific modelling for the prediction of emergence. Furthermore, the case studies have shown that the use of both the statistical and consultative approaches seem to be very complementary to one another. It is anticipated that more accurate results can be achieved if both are pursued in tandem.

A prototype mapping software has been developed to help visualise the predictions into maps for two distinct case studies. This mapping software can provide support when engaging with city or local officials on the topic, since changes in the evaluation of the indicators can be seen directly on the map in real time. However, from just the two case studies, it is not possible to propose generic software to map potentials for brownfield emergence as stated in the initial objectives of the project. This is due to the fact that local variations and attributes unique to the region being considered must be taken into account which presents a considerable challenge for the creation of a generic software.

This being stated, the statistical approach can be applied to any urban area within Europe if the proper measures have been taken to adapt the approach and any modelling/mapping software/tool to the local context. This requires the identification of the adequate early warning indicators for the area under consideration and the availability of a sufficient time series of data. Given these two aspects, a specific prediction equation can be generated. The consultative approach is best suited in areas where there is one or many local officials ready to engage in the dialog process.

3.8 Perspectives

The proposed method (the BOWET) with its two complementary approaches can help to advance urban planning processes and encourage dialog with local urban planners and agencies. This requires that the proper measures be taken to adapt the overall approach to each local context. Where this is properly achieved, the approach can become a tool for supporting sustainable development in European cities.

The prototype mapping software, despite still being a prototype at present and being not directly transferable to all regions, has potential for further use and development.

The overall proposed approach should help stakeholders and officials to efficiently use their resources to combat the future development of brownfields. This would make the stated "zero brownfield" goal of the HOMBRE project a reality in European cities in the future.

4 Test results from the Brownfield Navigator use in case studies: Planning the transition

4.1 Introduction

The items of the BFN in the planning the transition phase aim at providing better planning and more attractive communication technology that allows for a more holistic appraisal of BF regeneration options and early stakeholder involvement.

The BFN helps to visualise planning scenarios and is targeted towards improving decision making at the level of area planning, managing a portfolio of sites, or project planning. The BFN enables stakeholders to design well balanced use combinations that will meet planning objectives and indicators (quicker, cheaper and more sustainable).

The planning the transition phase goes into effect when 1) a BF is needs to be redeveloped or 2) when a site is suspected (with Early Warning Indicators) to become a BF. Then actions need to be taken to prevent sites to become a BF.

The items (table 4.1) in this BF phase can help local authorities and urban planners to identify opportunities and strategies that they can implement in their redevelop action. These items give input for an opportunity and feasibility plan for the BF.

Table 4.1 General and specific BFN items for the planning the transition phase

Item	phase	Goal tool	Developed in:	Tested in:
Map & Sketching	General	GIS tool to view maps, import data, make sketches	WP3	Genoa, Italy ch 4.2
Note pad	General	Make and save notes	WP3	n/a
Example library	General	Database with examples of BF regeneration projects	WP3	Genoa, Italy ch 4.2 Markham Vale, UK , ch 4.4
Rounds model	General	Document and save information on stakeholders, decisions made	WP2/3	n/a
Reference library	General	Database with relevant literature, reports and websites	WP3	n/a
Vision Ambition and societal demands	Make the transition	tool for formulating SMART ambitions	WP2/3	Genoa, Italy ch 4.2
Bioenergy Tool	Make the transition	flowchart to identify feasibility for bioenergy production	WP5	Deliverable 5.3 (Ferber et al, 2014) Genoa, Italy ch 4.2
Construction and Demolition Waste flowchart	Make the transition	flowchart to identify feasibility for reuse of construction and demolition waste materials	WP4	Spain, acciona
Brownfield REMIT/RESPONSE BR2tool	Make the transition	systems tool for comparing redevelopment options	WP6	Rotterdam, NL, ch 4.6 Markham Vale, UK del.6.3 (Menger et al., 2014)
Brownfield	Make the transition	tool to examine pros and	WP5	Genoa, Markham

opportunity matrix		cons of interventions for soft end uses		Vale, UK del. 5.2 (Bardos et al., 2014) Rotterdam, NL ch 4.2
Workshop for technology trains	Make the transition	Workshop setup to assemble technology trains for regeneration of brownfields	WP4	Solec, Poland Utrecht, the Netherlands Terni, Italy deliverable 4.4 (Smit et al, 2014)
Circuse land management tool	Make the transition	land management tool to classify and determine strategies for brownfields	n/a	Developed in CircUse (2013)
Regulation checklist	Make the transition	Check and add relevant (EU) regulation for brownfield regeneration	WP3	n/a
Scenario evaluator	Make the transition	evaluate regeneration scenarios based on set ambitions	WP2/3	n/a
Manual	general	Red line document and instruction on how to use BFN tools	WP7	Deliverable 7.2 (Wendler, 2014)

4.2 Testing BFN items on the Genoa case

In Genoa the Polcevera delta site (Table 4.2) was discussed and used. The BFN was tested in May 2014 with a group of stakeholders from both municipality and from the local community. It was a combined workshop, where the BFN (deliverable 3.1, Maring et al., 2013-II) and the Brownfield Opportunity Matrix (deliverable 5.2, Bardos et al., 2014) were tested. The minutes of this workshop can be found in Appendix E.

Table 4.2 description of the Polcevera river delta

Polcevera river delta, Genoa - Italy	
Type	Industrial, urban
Characteristics	• Old harbour infrastructure and industrial plants • Cultural heritage: historic buildings • Future use: - residential area with cultural and recreational “hot spots” - business area - natural reserve in delta and a system of parks and greenery • Development of city transport
Stakeholders involved	• Land owner: City of Genoa • Genoa Port Authority • Public authorities: Regional Environmental Agency (APA) • Industrial companies • Municipal Urban Lab • Local government (Municipio del Medio Ponente)

The BFN and the Brownfield Opportunity Matrix (BOM) were discussed The BOM helps to select soft uses, starting by services that are desired in an area, followed by interventions one can do to realize these services. The demand for services (BOM) in the area was discussed, for which the vision, ambition and societal demands item of the BFN was used first. This tool helps stakeholders to formulate SMART ambitions for an area or site. This worked quite well. When the discussion came on biomass, the bioenergy flowchart was used. The plans for the area were sketched, using the BFN's mapping and sketching tool. Also the example library was used in the discussion.

Figure 4.1 stakeholders working with the BFN in Genoa

Main findings and recommendations

BFN USE

- The stakeholders had expected more 'technical' tools, hard to understand and use. They were pleased because 90% was easily understood about BFN. The suggestion is to make every part of BFN very easy to handle. Nice to look at, easy to comprehend. First sight appealing, and then you can go to a more detailed version.
- Using a touch screen stakeholders would be more involved. Note: it is possible to use the BFN on a touch screen eg tablet / design table, but it was not available during the workshop. Using an interactive design table is better than beaming it with a moderator. More active involvement / use.
- BFN is different than what people are used to. Meeting with other stakeholders from the beginning is not so common in Italy. BFN makes exchange easier between different kinds of people.

BFN items

- The example library, in particular successful redevelopment cases, were found very useful, to show which kind of interventions are needed and the potential results.
- Main comments were on the aesthetics of the Map and Sketching tool of the BFN: Stakeholders expected a better resolution in drawing.

They suggested improving the aesthetics of the final product to present to the politicians. This is a point of attention for the BFN: to work on expectation management. BFN is a discussion tool not primarily meant for presentation. For presentation it is needed to involve a designer for making artist impressions. However, nicer visualisation may help in discussion.

- They suggest a rendering function, 3D pictures, and animations to improve the image in order to impress politicians. (Adding maps with timelines is a possibility in the BFN).
- The bioenergy tool got some comments on the layout (adapted in the meantime). But further it worked well. Because the tool asks for site size, it is suggested to calculate area dimensions of drawings / present some parameters in drawing. There were no comments on the Vision, ambition and societal demands tool.

Further recommendations

- It is strongly suggested to add costs: maintenance costs/cost for different for land uses (country specific). Because the BFN has a modular set-up, this can be implemented at a later stage in custom made versions of BFN, e.g. make a list with what kind of costs you can expect instead of giving actual costs. Note that costs are quite specific for, and even within, the different member states.

BOM Use

- The Service Guide might be very well combined with the BFN ambitions part. Recommendation is to add the service guide to the BOM. (see also deliverable 5.2, Bardos et al., 2014)

BOM: Level of detail

- BOM is meant for experts, but is still quite difficult to use with stakeholders in this form. It would be useful to make a simplified version for stakeholders. First inventory and then go on with detailed info.
- Layout: Less rows and columns. Too much information for one screen. Works for desk study but not when it is used for a group on a beamer (does not fit one screen). Too many colours and icons in the matrix.
- Names of the cells description must be easier: ISICS/HLOW. Even other simpler names (opportunity windows) is too difficult
- It takes too much time to explain the BOM to the public (motivated and beforehand informed public). Rewrite first few sheets in presentation: expectation management

BOM Content

- More region related information:
    - Split up the BOM in climate regions
    - Split up for urban / rural / coastal areas
- Connectivity is not addressed in the BOM (connection to water/sea, add green infrastructure part)

4.3 Construction and Demolition Waste flowchart tested in Spain

The construction and demolition waste flowchart was presented to different departments of "ACCIONA Infraestructuras" a company that covers the whole life cycle of a construction site from the tender/offer to the departments involved in the management of construction and demolition waste (C&D waste).
In addition, the tool was presented to the Spanish federation of C&D Waste (FERCD, Federación Española de Residuos de Construction y Demolición) and experts in construction and demolition waste.

Main findings

- The tool is useful and clear to estimate the waste management plan
- For the tender and contract department the tool is useful in order to include, from the proposal stage in BF redevelopment and rehabilitation works, the quantification and type of waste that can be generated and propose alternatives to landfill or specialised manager for the end-use of waste. In addition, it helps to show clients different services that can have added value.
- It is good that the tool includes examples of other projects. Useful for innovative ideas.
- Provides information about innovative strategies
- It is easy to follow and facilitates to explain clients and land planners different strategies and uses of construction and demolition waste

Recommendations

- The test persons suggested that it would be useful if the tool could have a possibility for quantification of C&D waste also for civil works, not only for buildings.
- To estimate the type and amount of waste for construction unit in civil works (as an example, 1 Km of road).
- To add cost of different treatments, cost of final solution, a cost saving. To include cost and energy balance. Also it could be an idea to include information about improvements from the environmental point of view.
- To include a spatiotemporal analysis for construction pacification. To define the space to use, the time and equipment for a given volume.
- Sometimes is not intuitive and more options and opportunities could be included.
- To include information about legislation and best management practices for other countries in Europe.
- The application should provide data to determine the possibility of recycling at brownfield sites and dramatically change the assessments and costs.
- To include cost and energy balance

4.4 BFN presentation in Markham Vale (UK)

In September 2013 a HOMBRE team had an initial workshop on the developments in Markham Vale. From talking to the Markham Vale team it seems that the steps of the BFN can be incorporated with their practical work. The team was very interested in the generic approach of the BFN and the different items it presented.

From the visit there are five points that where either new or considered of importance for the development of the BFN.

Main findings and recommendations

Getting Inspiration:
The example library was considered a very useful aspect of the BFN. It allows the user to look to other projects to see how they have done. It also gives insight to possible choices for developments and strategies concerning BF redevelopment. Extending and continued development of the example library is advised.

The bigger picture:
Sightlines and 3D visualization can be very valuable for visualizing the redevelopments.

Data safety:
Not all data is open or even allowed to be put online in a secured area. The BFN should support different security levels concerning data. The current BFN is online, with sessions behind password security. In future developments the options for offline use and local data storage should be kept open.

So many people so many wishes:
How important the different stakeholder's wishes are became very apparent in Markham Vale. The BFN has items and information to deal with this challenge. But the items should be tested for each different cases if they are applicable for the specific purposes of the user.

Document management:
Another aspect of the BFN that was considered valuable was document management. Having your project in one place and seeing an overview of the project (and documents) was something that was considered important and valuable. This includes the history of the decision-making. Something that was also interesting was having a public version (public documents) and a non-public version. This can be done with the different log-ins.

4.5 Workshop on Golden Questions for technology trains in Solec-Kujawski, Poland

In the HOMBRE case Solec-Kujawski (table 4.3) the BFN was presented to stakeholders twice during workshops in April and June 2013. The BFN was used to record some of the discussion in the first meeting in the sketching tool (figure 4.2, the full text of the post-it was added to the figure for presentation purposes). However, this was not interactively done and not discussed with the municipality.

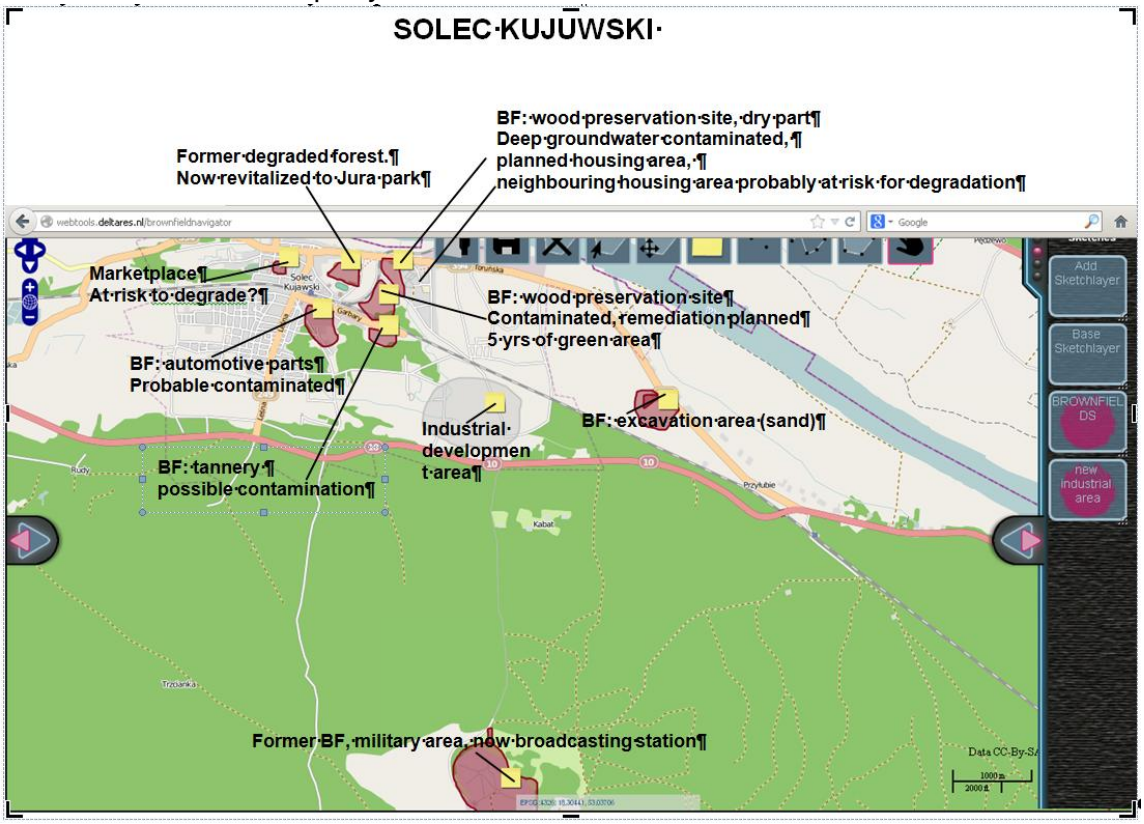


Figure 4.2 drawings during the workshop of April 2013 in an initial BFN set-up

In September 2014, the item “Workshop on golden questions for the design of Technology Trains” was tested with the municipality and HOMBRE partners (WUR, AGH and Geo-Logic). To unravel the complexity of drivers and barriers that influences the redevelopment of BF sites, a logic of six Golden Questions or Key considerations was formulated in order to define the setting in which technologies can play a role and to set up technology trains. In Solec-Kujawski these Golden Questions were tested for their relevance and helpfulness in understanding the choices for technologies as well as recognizing the driving forces at specific BF sites. During site visits and the earlier workshops it became clear that for tackling the problems at the former wood preservation site could be handled with technologies like soil washing in combination with bioremediation in so called Bio-prisms. Besides, also the (financial) funding of the remediation project is available. Therefore interest in specific newly developed combinations of technologies as within the Technology Trains, to reduce remediation costs or increase benefits, was minimal. Emphasis in the workshop was therefore not on the technology train as such, but on the function of the Golden Questions that can be used to structure a discussion on how to discover hidden values at a specific BF site.

Two strategies on how to implement new technologies either via 'technology push' or via 'technology pull' were stressed. As an example, all Golden Questions were addressed to the Utrecht case (see for details D4.4, Smit et al, 2014).

Table 4.3 Description of Solec Kujawski case

Solec Kujawski (Kuiavia-Pomerania Region) - Poland	
Type	Urban & post-industrial
Characteristics	• In the central part of the case study area a former manufacture for wood impregnation is located. However, the buildings were demolished a few years ago but ground and groundwater are still heavy polluted by creosote. • This typical BF is located between housing estate (high-rise blocks, school, shops etc.), railway line and city forest with local touristic attraction named Jura Park. On the other site of the railway line are located other BF's: old multi-use buildings and storages as well as small complex of shoe industry on the former tannery area. In this part former spill ponds (waste water from tannery and from metal industry) were detected. These days, there are small private gardens and young forest. In this part a local cool heating plant is located. • Location: city Solec Kujawski (Kuiavia-Pomerania Region of North Poland), inside the city limits; • Site area: 80 ha (incl.10-15 ha heavy contaminated area – ground & groundwater); • Contaminations: former impregnation manufacture – creosote: oils for wood impregnation (phenols, PAHs, BTEX, PCBs), heavy metals from former tannery and metal industry. Contaminated soil, groundwater, exhalation into the air during the warm periods; • Owner of the property: Commune, City Solec Kujawski, National Forestry, State Treasury, Residential Co-operative • Intended future use: if it is possible to regenerate and recycle the land, it is envisaged to develop recreation via a city and commune sport centre, which together with the Jura Park in the forest, today located near heavy polluted brownfield area, will bring growth of tourism in the region.
Stakeholders involved	• Commune and City Solec Kujawski

Main findings

- The participants in the Solec Workshop recognized the Golden Questions as a systematic approach to discuss the BF issue. They stated that in their own approach till now they implicitly followed a similar approach. The Golden Questions and their own approach have in common that they are in essence based upon 'common sense'. By performing the discussion in this structured way by using the Golden Questions and a moderator, they realized that the term BF has a much broader meaning than they were using before in their discussions upon the wood conservation site.
- The stakeholders in the workshop expect that the Golden Questions will lead to a better planning of the redevelopment plans at Solec Kujawski. Also they are aiming at to use these questions in future discussions in which the redevelopment will be worked out in more detail. Further they stated that in a Brownfield redevelopment planning a retrospective approach as is done with the GQs is essential anyway to come to a good quality redevelopment. Such retrospective approach will avoid making the same mistakes as made in the past and may help to avoid the creation of new future Brownfields in future.
- The stakeholders liked the workshop as it was dealing with a real existing case. The participants put forward that: to avoid generation of new BFs is a big challenge for society. However at the end of the workshop the participants were convinced that for the Solec Kujawski case it will be possible to make a success from a problem.

Recommendations

- The selection/invitation of stakeholders requires some attention. To obtain maximum value from the workshop it is essential that participants from a large array of backgrounds and thematic expertise are present and that they can speak freely. This can be hampered in cases where higher management (e.g. the mayor of a city) is present. (this was not seen as a problem in Solec-Kujawski)
- The role of the moderator is very important to initiate discussions between stakeholders and to make sure stakeholders address/discuss the relevant aspects. In order to invite stakeholders to actively participate, the mediator needs to have sufficient understanding of the case to pose (for example) a proposition. Also, the mediator must sense the current status of the case; when the status of BF transition is still exploratory more attention must be given to generic ambitions and problems while in case ambitions and problems are more clear, more attention can be given to set boundaries and goals for technological and non-technological interventions without actually designing the technologies themselves.
- Use of a visualization tool such as BFN would help to identify mass flows (energy, water, materials) that potentially can be used to support the BF redevelopment.
- Starting the workshop with an elaborated example (such as Utrecht in this case) helps to explain the need for a systematic approach such as the golden questions. When also the problems that were faced during the redevelopment of the example case are openly discussed, an open atmosphere for the workshop can be expected.

4.6 BOM and BR2 in Rotterdam, Netherlands

In a spinoff project of HOMBRE, The SNOWMAN project Balance4P[3], two internships (both 2.5 months) were dedicated on testing two tools of HOMBRE on one of the Balance4P cases: Merwevierhavens in Rotterdam, The Netherlands. This is a (former / underused) harbour area which will be converted to a mixed urban area. The work was done by students of the Technical University of Delft, department Architecture, within the course AquaTerra Urban Design. The main objective of the internships was to integrate natural system in the design process and, next to that, see how the tools can be used in the design process of an urban planner / designer.

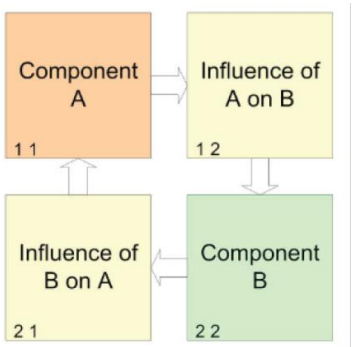
Brownfield Remit/Reuse BR2 Tool

For the Brownfield Remit/Reuse (BR2) tool was investigated how it could be used in an urban design process for the redevelopment of a BF. The tool was applied as desk study and in a workshop with a small group of stakeholders and experts. The task was to assess multiple options for redeveloping the purple area (figure 4.3) within the Merwe-Vierhavens area. This area will eventually be redeveloped towards dwellings, offices and businesses. The location is heavily polluted and costly to remediate. Therefore multiple options for redevelopment are assessed. In the workshop, only the transformation towards an interim function cultural park is assessed. As a reference the Emscher park in Germany is used. In a later stage other functions can be realized next to and/or instead of the cultural park.

Figure 4.3 Phasing of the redevelopment of the M4H area.

[3] http://www.chalmers.se/en/projects/Pages/Balance-4P.aspx
http://www.snowmannetwork.com/main.asp?id=255

Main findings:



The BR2 is a system analyses tool that works via a matrix - an N2 chart - that models the urban fabric of the city. The matrix is build-up out of squares representing the fabric and its functioning. The diagonals from the top left corner to the right bottom form the important elements e.g. housing stock, transportation, biodiversity etc. Each other square is horizontally and vertically linked to two components and describes the relation between the first and the second one. An interaction matrix can be tailor-made for every specific site. When filling in the matrix completely one can see which aspects are dominant and which subordinate in the redevelopment, e.g. by changes in land use (Deliverable 6.2)

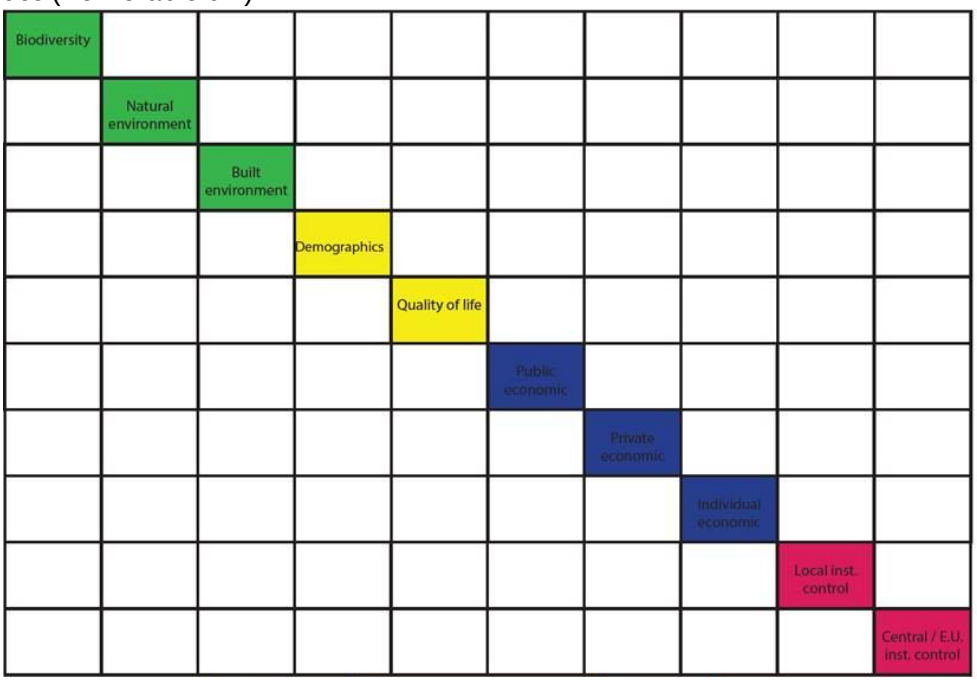


Figure 4.4 Default matrix for BR2tool.

Lay out of BR2tool

The excel file itself is very user friendly and well organized. The colours that are used when identifying and valuing the relations can be confusing. When a relation is active, a red colour is given. This might call forth associations with a negative relation, while there is only meant to indicate there IS a relation.

Definition of the boundaries of the site.

Sometimes the context of the defined site was included and sometimes it was excluded in the discussion. When talking about demographics for example, there was concluded that there would be no inhabitants living on the site and the inhabitants of the immediate context were not taken into consideration. The relation of natural environment on individual economy was defined as value of housing, but was left out (unjust) because there was no housing on the site.

Definition of terms

For example 'built environment' is sometimes defined as quantity and sometimes as quality (the relation between natural environment and built environment is about quantity where the relation about built environment and quality of life is about quality). The relation between quality and quantity is not always equal. When more natural environment leaves less space for built environment, that is negative for the quantity of built environment, but it does not say anything about the quality of that built environment. Overall, the definitions should be unambiguous (e.g. quality and quantity is ambiguous).

Double counting

During the workshop, the danger of double counting for different relations existed.

Use of the matrix

The method can be used to get a better understanding of the urban system. However, this should be done with a balanced group of stakeholders to avoid manipulation towards desired outputs. The result showed a good overview of dominant or subordinate and less or more interactive factors in this particular scenario. This can help the designer by taking critical factors into account and to steer onto ambitions on the site. The tool can be used in assessing effects of different land uses, but also in phased succeeding redevelopments.

Figure 4.5 possible moments to use the BR2tool in a design process

Recommendations

- Perform the exercise with a balanced group of stakeholders to avoid manipulation of the output
- Prepare the workshop and go together through the definitions used
- Define boundaries of the study area, as well in space as in time span

Brownfield Opportunity Matrix (BOM)

The intern study of the Brownfield Opportunity Matrix was aimed at finding out how the matrix can be used in the design process of an urban planner / designer. For the integration in the design process a distinction has been made between three different moments when the knowledge presented in the tool could be applied. These three different moments are at the beginning of the design process, during the entire design process and at the end of the process, this resulted in three ways of using the tool: Method 1: Creating a concept; Method 2: using the matrix during the design process; Method 3: use the matrix to assess a design.

Method 1: Creating a concept

Starting with the first method of applying the tool, at the beginning of the design process, the tool can be used to create a concept or explore an area and see what possibilities in development would be beneficial or preferred in an area.

This method was tested in a workshop with a group of people familiar with using tools and planning. The workshop itself was a short session of one hour, decisions had to be taken fast. The setup of the workshop was to indicate in what services the group is interested in for the area and how they could be implemented in the project area. The tool is used as discussion catalyst. The chosen services are given a colour that also is placed on a corresponding spot on a map of the area.

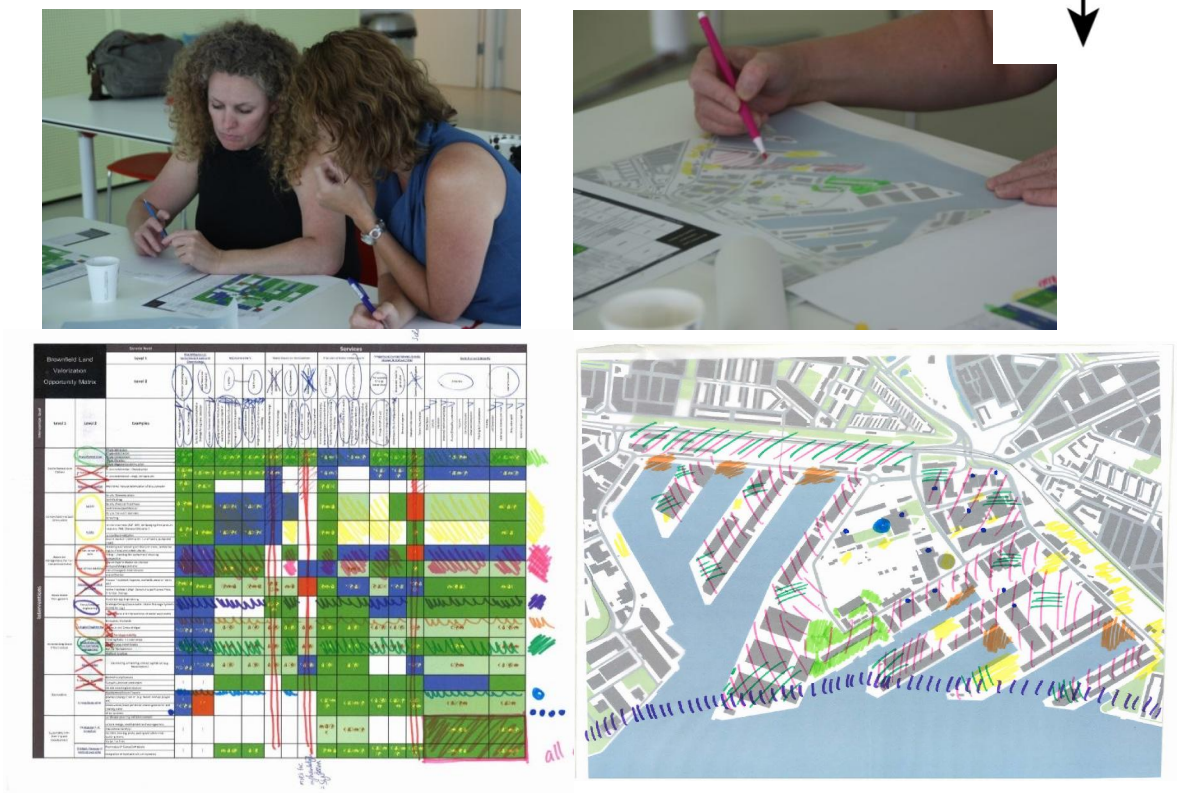
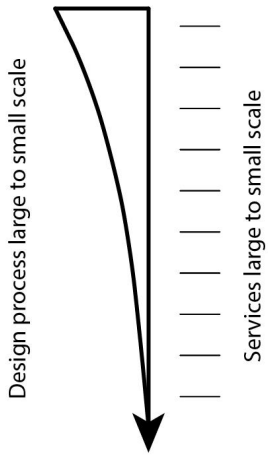


Figure 4.3 Applying the BOM on MerweVierhavens case

During the workshop the tool was used in an inverted way. In the case of the workshop first the services were considered. After this, instead of using the matrix to find interventions to realize the chosen services, the group went through the list seperately selecting those that they seemed most suitable. They were able to do this because of insight and expert knowledge within the group. The color indicators within the tool were used very generally to the extend of “Is it overall green?” and “Is there no red?”
Passing along the services listed in the matrix the group selected a set of services for the project. Almost all services were selected as desired. Only those not applicable to the area were excluded. With such a large selection, the focus for the redevelopment will be very wide. For a concept it would be better to select a few services as main drivers for a project area. In the case of the Merwevierhavens it still could work with the selection of this many services since the area is very large.
Overall the results of the workshop were quite satisfactory for the short period of time given.

Method 2: The matrix in process
The second method originated from the fact that within the matrix the services provide interventions for different scales in an area. That means the services are relevant in a different part of the design process as often is worked from larger to small scale.



Using this method lead to a different strategy to plan for a BF because some issues presented themselves. During BF redevelopment often the program of requirements is not very clear, because interested parties are lacking, hence the area is a BF. Also for the case of the Merwevierhavens the project site is very large and the amount of interventions that can be selected and integrated is very wide. Also there are a lot of different ground owners in the area with different exploitation expirations the ground with gradually be available instead of everything in one go.
Making a design for the whole area in one go can be difficult and unrealistic. A combination of gradual development and temporary functions could be the solution to redevelop the sites effectively.

The basic principle is to start the development on a small area within the BF. When this first development is finished or when is progressed far enough a second area can be assigned for development. This area should be adjacent to the first with a supporting function for the first area, for example this can be gentle remediation and a park. It should be possible to plan temporary uses in these supporting areas. When the supporting area has attained its new value it can be further developed and a new supporting area is assigned. This way the area can redevelop over time as result of actual demand.

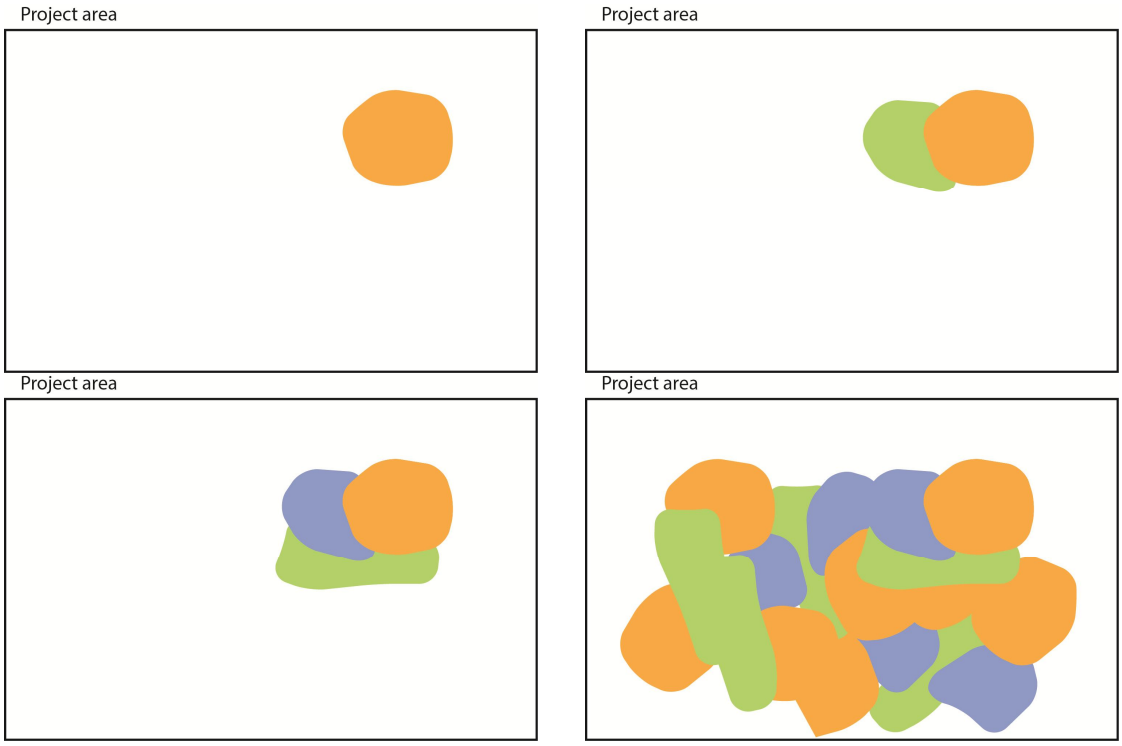
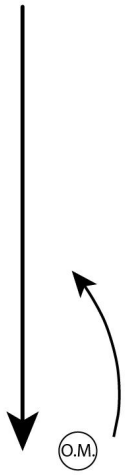


Figure 4.4 Redeveloping a BF site over time

The tool is used in this method to assign the land use or required services in the adjacent temporary supporting areas that are developed along the newly built environment. In BFs this could mean needed remediation, desired amenities or reduction of other environmental hazards.

Method 3: A design in OM retrospect

In this third method the matrix can be applied when a design is finished or almost finished. When a design for an area in general (not just brownfields) includes sustainable land use or temporary green interventions, the matrix can be used to see if optimal choices are made. It is possible that the choice for a different intervention could address more potential services. Also if certain land uses are assigned it is sometimes possible to integrate different types of services with the already planned typology. Opportunities like this are interesting to contribute to the richness of a plan and increase its value due to multifunctional use.



This method has not been tested in this study because it does not take place within the main design process. The tool in this manner is more used as an analysis tool instead of an integral part of the design process. However it can contribute to the quality of a finalized plan and is worth mentioning.

Main findings:

Displayed information: The matrix itself is working out pretty well with the color indications. This was used in the workshop to see if selected interventions for services interfere with others. Looking for interference in interventions with other services worked well as a selection strategy.

Information amount: When using the matrix to set up a general concept for an area, the amount of information in the matrix is a bit overwhelming and not all (yet) relevant for the design. The information in the HLOW windows is rather extensive and describes the interventions thoroughly. The large difference in detail between the main matrix and the HLOW windows demands a lot of reading (and thus time) while going through the matrix. This hinders the design process.

Descriptions: When looking for a service the categories are not always as clear. Most of the time it is more convenient to skip the level 1 service description and just start going through the list under level 3 looking for inspiration. The services under Socio-Economic Benefits seem out of place in the matrix. The services that can be found under Amenities are services that should not stand on themselves. The amenities are spatial qualities that can be used in a design to integrate with the interventions listed in the matrix, they offer space to create added value.

Consistency: There is a lot of differentiation among the different services. The largest division is the difference between services that are principles and those that are more defined elements. For instance managerial interventions like promotion of green and soft use and defined elements like green bridges and ecoducts.

Value indication: The information presented in the main matrix about different capitals and values were not used in either method. In a first overview on the services and interventions it is not really relevant to distinguish three separate kinds of economic benefits, for a design just economic benefits is fine. The indication for Natural capital is found to be rather obvious. Also the value names of the value indicators on themselves are rather bland. That means they mainly clutter the overall matrix. Under the HLOW windows there is space to address how and what kind of value is created.

Recommendations

Users: The most critical point on the use of the matrix is the need for expert knowledge to work in a quick and convenient way. Even in the workshop where most of the participants are familiar with the discussed matter further explanation was needed with some of the interventions because some tend to be very technical. When a group not familiar with the matter is presented the matrix the proces can be slow and confusing rather than productive. It can be considered to make different versions of the matrix (for the purpose of using it as quickscan in a workshop with diferent stakeholders and for the purpose of expert use).

Enhancing use of the matrix: In the overview of the matrix already a lot of information is presented. While decisions are made on different topics some features might help to manage the initial amount of information. The first being the ability to hide columns and rows that contain redundant information. The second suggestion was the ability to prioritize between the choices made. This could function together with turning off information in the matrix. Highlighted information would be priority for the project, normal visible interesting secondary aim and turned off information is not relevant for the project.

Decision support: A stronger distinction between “strongly contributes”, “contributes some”, “may contribute”, “no influence” and “may be detrimental” would help in choosing interventions. When everything is green it gives the impression that most interventions work well with most services. For futher support for choosing interventions, the workshop participants were interested in a short overview of the following information: disruptance of normal processes in the area during the interventions, an indication of costs and the time needed for implementation of the interventions. For planning especially in urban transformations it is nice to know how long certain steps in the process take. The interventions vary from just the time for implementation of an intervention to processes that take years. When planning phasing or temporary use of an area timespan is important.
Image: When browsing through the intervention HLOW windows a lot of detailed information is presented. It would be nice to be presented in a first glance an additional summarized overview. In these windows different options are presented to fill in an intervention with advantages and disadvantages. These can be presented initially in keywords. Alongside a picture can be included of the intervention so you can get an impression of the scale of the intervention, the special implications and the disruption it can bring in an area.

5 Recommendations / future development

5.1 General recommendations

The BFN was constructed with the input of cases (stakeholders) and the work performed in different work packages (a top down and bottom up approach).

Because each case (in a different member state), is a different situation, with other boundary conditions, environment, rules, operation procedures, it was chosen to keep the BFN generic. With the BFN, a “body” was delivered with a modular set-up. Generic tools fit in an initial, investigating phase. However, when going forward in the process and planning, more specific information and tools will be needed. In future projects, it is possible to adapt this “body” towards more specific situations and tasks. One can also think about making a BFN country specific and adapting the language.

Financial viability is not included in the BFN. However, the need it was expressed by Genoa stakeholders (Genoa, Ch 4.2).

Sharing information with different users is seen as valuable (Markham Vale Ch4.4). The BFN can be used for communication with the local community (Genoa, Ch4.2).

Data security is a point of attention in future developments. This was both mentioned by the advisory board and the cases during the development. Sessions are secured behind a password. However, this is not fully safe against hacking. It is now possible to remove the uploaded data and download the full sessions to a local computer. An offline version of the BFN can be a possible development (Markham Vale Ch 4.4).

5.2 Specific recommendations for items

Note that not all items were tested. The more recommendations indicated in this case also more thorough testing.
Example library is seen as very relevant and valuable (Genoa, Ch4.2; Markham Vale Ch4.4). Recommended is to keep the database “alive” by adding new examples.
Brownfield Opportunity Matrix. Advised is to simplify the BOM, so it can also be used by non-experts (Genoa, Ch4.2; Rotterdam Ch4.6).
The BOM can be used in different parts of the design process (Rotterdam Ch4.6).
BOM and BFN can have a better connection: The Service Guide of the BOM might be very well combined with the BFN vision, ambitions and societal demands item. Recommendation is to add the service guide to the OM (Genoa, Ch4.2).
The tool can be made more site specific by considering local circumstances (eg climate) in the information (Genoa, Ch4.2). Connectivity is not addressed in the OM (connection to water/sea. Add in green infrastructure part) Genoa, Ch4.2). Information on disruptance of normal processes in the area, an indication of costs and the time needed for implementation of an intervention was requested by the workshop in Rotterdam (Ch4.6).
BR2 Tool
The Br2 tool can be used in different parts of the design process. The tool can be used best within a group of stakeholders. Advised is to look carefully at the definition of terms that are used in the tool, to be sure that stakeholders are talking about the same thing. (Rotterdam Ch4.6). The BOM can work with the BR2 tool, by using initial BR2 assessments to

identify key driving forces for service requirements. The outputs of the matrix can also be fed back into the BR2 tool to describe a post regeneration status for the site. (BFN manual on bfn.deltares.nl)

Construction and Demolition Waste flowchart the test persons recommended a broader scope: e.g. add infrastructures next to buildings add more possibilities of quantification and adding costs, give more possibilities and information e.g. on regulation (Spain, Ch4.3). Another recommendation can be to also test the tool on cases outside of Spain, because of other circumstances and boundary conditions.

Mapping and sketching item: For the visualisation of designs, more advanced options were demanded by the users in Genoa (Ch4.2) and Markham Vale (Ch4.4). 3D, small videos etc were mentioned. For a more specific version of the BFN, with the aim of communication and visualisation, this could be a future development.

The BFN mapping function can be used to help to identify mass flows (energy, water, materials), potentially this can have a connection with the technology trains workshop from WP4 (Solec, Ch4.5).

During the HOMBRE final conference (14-16 Oct 2014), a recommendation was made to make it possible to connect to (local/national) databases. This possibility is already integrated in the BFN. Data enclosed following INSPIRE can be coupled. This was tested in the Netherlands with data from the Dutch database https://www.pdok.nl/. However this feature needs some elaboration in the selection of maps within the BFN mapping and sketching item.

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- Bertelsmann Foundation 2014 http://www.bertelsmann-stiftung.de/cps/rde/xchg/bst_engl/hx.xsl/index.html
- BOWET (anticipating BrOWnfield Emergence Tool) instruction film: ftp://ombre:brownfield@ftp.brgm.fr/HOMBRE_demo_v0-2.mp4
- Brownfield Navigator (BFN): bfn.deltares.nl
- Circuse land management tool http://www.circuse.eu/index.php?option=com_showdown&typeid=10&Itemid=47
- Google Earth https://earth.google.com
- HOMBRE Final Brochure (2014) available on http://www.zerobrownfields.eu/quicklinks/HOMBRE_Broschure_2014_FINAL.pdf
- Publieke dienstverlening op de kaart
- https://www.pdok.nl/

Appendices

Appendix A – Anticipating Brownfield emergence – the initially 25 selected indicators for the French case
Appendix B– Anticipating BF emergence: indicators for which data was available for the French and German case
Appendix C – Anticipating Brownfield emergence – the initially 16 selected indicators for the German case
Appendix D – Anticipating Brownfield emergence – collected data and ranking method for the German case study
Appendix E – Minutes Genoa workshop May 2014
Appendix F – Minutes of the Golden Question Workshop HOMBRE Technology Trains Solec Kujawski (18 september 2014)

Appendix A – Anticipating Brownfield emergence – the initially 25 selected indicators for the French case

	categoy	sub category (famille)	indicator title	Assumed brownfield emergence that can be predicted	Link with BF emergence	Suggested spatial scale for monotoring the indicator	Suggested source of data	Which datasets were available for the French case? (Année)	Was the indicator chosen for assessing industrial brownfield potential within each of Orleans IRIS?	Indicator source/reference
1	Economic	Land use and land occupation	Percentages of areas under specific land use/specific sector	Any kind of Brownfield	For exemple, the less industry are present within an area, the less attractive the area may become and the highest the potential for BF emergence may become.	local (neighbourhood/IRIS preferably or the agglomartion)	urban services, notary services, estate agents have maps with such information and which they update regularly	We did not ask the mairie d'orléans if they had such data sets	not chosen as we did not have the time to ask Orleans for such data and analyse any data inputs.	HOMBRE (Ellen G. et al 2013)
2	Economic	Land use and land occupation	Number of operating installations for a specific sector	Any kind of Brownfield	The less industry are present within an area, the less attractive the area may become and the highest the potential for BF emergence may become.	local (neighbourhood/IRIS preferably)	INSEE - SIRENE - démographie des entreprises	datasets for 2006 to 2012 are available for each IRIS=> 2009 to 2012 only taken into account as change in data nomenclature prior to 2009	This indicator was chosen as 2009-2012 dataset was available for all IRIS. It is also assumed that it may be one of the facors to explain industrial Bf emergence.	BRGM from looking into available datasets in France
3	Economic	Land use and land occupation	Number of newly operating installations for a specific sector	Any kind of Brownfield	The less industry are present within an area, the less attractive the area may become and the highest the potential for BF emergence may become.	local (neighbourhood/IRIS preferably)	INSEE - SIRENE - démographie des entreprises	datasets for 2006 to 2012 are available for each IRIS=> 2009 to 2012 only taken into account as change in data nomenclature prior to 2022	This indicator was chosen as the 2009-2012 dataset was available for all IRIS. It is also assumed that it may be one of the facors to explain industrial Bf emergence.	BRGM from looking into available datasets in France
4	Economic	Land use and land occupation	Survival rate for industries over a 5 year period - all sectors undifferentiated	Any kind of Brownfield	It is assumed that the smaller the survival rates are, the less attractive the land may become, and the higher the potential for brownfield emergence may be.	local (neighbourhood/IRIS preferably)	INSEE (IDDT)	survaivial rate in 2005 for installations created in 2000 . Data sets are available for each INSEE employement area. For	Data available for the agglomeration and not for each IRIS. This is indicator is not chosen	BRGM from looking into available datasets in France
5	Economic	short term statistics regulations	Turnover for the industrial sector	possibly industrial brownfields	It is assumed that the smaller the turnover is, the less attractive the land may become, and the higher the potential for brownfield emergence may be.	local (neighbourhood/IRIS preferably)	INSEE	regional datsets available from 1990 to 2010	not chosen as only regional datsets (no IRIS datasets)	BRGM from looking into available datasets in France
6	Economic	short term statistics regulations	Turnover for the commercial sector	possibly brownfields from former commercial activities	It is assumed that the smaller the turnover is, the less attractive the land may become, and the higher the potential for brownfield emergence may be.	local (neighbourhood/IRIS preferably)	INSEE	regional datsets available from 1990 to 2011	not chosen as only regional datsets (no IRIS datasets)	BRGM from looking into available datasets in France
7	Economic	short term statistics regulations	Turnover for the service/transport sector	possibly brownfields of former service activities	, It is assumed that the smaller the turnover is, the less attractive the land may become, and the higher the potential for brownfield emergence may be.	local (neighbourhood/IRIS preferably)	INSEE	regional datsets available from 1990 to 2012	not chosen as only regional datsets (no IRIS datasets)	BRGM from looking into available datasets in France
8	Economic	short term statistics regulations	Turnover for the public admisitrations, teaching, social sector	Other types of brownfields	It is assumed that the smaller the turnover is, the less attractive the land may become, and the higher the potential for brownfield emergence may be.	local (neighbourhood/IRIS preferably)	INSEE	regional datsets available from 1990 to 2013	not chosen as only regional datsets (no IRIS datasets)	BRGM from looking into available datasets in France
9	Economic	Pressure on land value	Discrepancies in overall land use within one urban unit	Any kind of Brownfield	It is assumed that the more discrepancies there are, the less attractive the land may become, and the higher the potential for brownfield emergence may be.	local (neighbourhood/IRIS preferably)	No national dataset - advice from professional experts or obtain data from other relavant statistics	explain how we calculated it for orléans	This indicator was chosen as data is available. It is also assumed that it may be one of the facors for industrial Bf emergence.	BRGM/Stadt + discussions
10	Economic	Pressure on land value	Discrepancies when comparing main land use within one urban unit with main land use in adjacent urban units	Any kind of Brownfield	It is assumed that the more discrepancies there are, the less attractive the land may become, and the higher the potential for brownfield emergence may be.	local (neighbourhood/IRIS preferably)	No national dataset - advice from professional experts or obtain data from other relavant statistics	none	not chosen	BRGM/Stadt + discussions
11	Economic	Pressure on land value	Land value	Any kind of Brownfield	It is assumed that the lower the land values become, the higher the potential for brownfield emergence may be.	local (neighbourhood/IRIS preferably)	notary offices, urban agencies and estate agents may have the data	public available online dataset from efficity.com, where property prices/m2 can be obtained for each commune. Only year 2014 (Source : http://www.efficity.com)	This indicator was chosen as data is available for 2014. It is also assumed that it may be one of the facors for industrial Bf emergence.	HOMBRE (Ellen G. et al 2013)
12	Social	Accessibility, mobility, operational efficiency	Time due to congestion	industrial brownfields, residential brownfield	It is assumed that the longer the time due to congestion when commuting is, the less attractive the areamay become, and the higher the potential for brownfield emergence may be.	local (neighbourhood/IRIS preferably)	Local authority - urban services may have such information (local urban plan - PLU). Otherwise, obain from assessing	We did not ask the mairie d'orléans if they had such data sets	We did not ask the mairie d'orléans if they had such data sets	HOMBRE (Ellen G. et al 2013)

	categoy	sub category (famille)	indicator title	Assumed brownfield emergence that can be predicted	Link with BF emergence	Suggested spatial scale for monotoring the indicator	Suggested source of data	Which datasets were available for the French case? (Année)	Was the indicator chosen for assessing industrial brownfield potential within each of Orleans IRIS?	Indicator source/reference
13	Social	Accessibility, mobility, operational efficiency	Connection to/avaibility of good public transport for local residents	residential brownfields	It is assumed that the worse public transport avaibility is , the less attractive the areamay become, and the higher the potential for brownfield emergence may be.	local (neighbourhood/IRIS preferably)	Local authority - urban services may have such information (plan de déplacement urbain).	We did not ask the mairie d'orléans if they had such data sets	It is also assumed that this indicator is not amongst the facors for industrial Bf emergence.	BRGM/Stadt + discussions
14	Social	Accessibility, mobility, operational efficiency	Distance to nearest highway	toute nature confondue	It is assumed that the longer the distances to nearest highway are from specific urban areas, the less attractive the land may become, and the higher the potential for brownfield emergence may be.	local (neighbourhood/IRIS preferably)	It is possible with satellite imagery and publically available mapping services to calculate the distance of specific urban	explain how we calculated it for orléans	This indicator was chosen as it was possible to estimate the distance from each IRIS to the nearest highway	HOMBRE (Ellen G. et al 2013)
15	Social	Accessibility, mobility, operational efficiency	average time for accessing the nearest every day services from home	residential brownfields	It is assumed that the lmore it takes to get acces to shops and services, the less attractive the areamay become, and the higher the potential for brownfield emergence may be.	local (neighbourhood/IRIS preferably)	Observations et Statistiques du ministère de l'environnement	2006 dataset	This indicator was not chosen as scale for orleans only. It is not provided for each IRIS	BRGM from looking into available datasets in France
16	Social	Accessibility, mobility, operational efficiency	Commuting time	residential brownfields	It is assumed that the longer time is, the less attractive the areamay become, and the higher the potential for brownfield emergence may be.	local (neighbourhood/IRIS preferably)	Statistiques du ministère de l'environnement	2007 dataset	This indicator was not chosen as scale for orleans only. It is not provided for each IRIS	BRGM from looking into available datasets in France
17	Social	Obsolescence	Age of the buildings	residential brownfields	It is assumed that the older the residential buildings are, the less attractive the area may become, and the higher the potential for brownfield emergence may be.	local (neighbourhood/IRIS preferably)	INSEE BD - logement 2010	BD Logement INSEE 2006 to 2010 => données 2004 à 2008 for each IRIS? (et données antérieurs)(2008 is the last dataset for which age fo the buildings are provided	This indicator was not chosen as it is assumed that is not relevant for assessing industrial BF emergence.	BRGM/Stadt + discussions
18	Social	Obsolescence	Needs for thermic improvements in principal living accomodation	residential brownfields	It is assumed that the more thermic renovations are needed within an area, the less attractive the area may become, and the higher the potential for brownfield emergence may be.	local (neighbourhood/IRIS preferably)	No national dataset - seek advice from professional experts (infra red mapping, etc…)	no data set was available	This indicator was not chosen as it is assumed that is not relevant for assessing industrial BF emergence.	BRGM/Stadt + discussions
19	Social	Obsolescence	Well-being and comfort in housing	residential brownfields	It is assumed that the less minimal comfort there is with principal accomation within an area, the less attractive the area may become, and the higher the potential for brownfield emergence may be.	local (neighbourhood/IRIS preferably)	INSEE	2008 population census - data on main principal accomodation	This indicator was not chosen as it is assumed that is not relevant for assessing industrial BF emergence.	BRGM/Stadt + discussions
20	Social	Well being	Average age of inhabitants	possibly residential brownfields	It is assumed that the older the population composition may become, the higher the chances are that the households in which older residents live may become vacant in the future	local (neighbourhood/IRIS preferably)	INSEE	2009 INSEE data sets , and also since 2006 for each IRIS	This indicator was not chosen as it is assumed that is not relevant for assessing industrial BF emergence.	HOMBRE (Ellen G. et al 2013)
21	Social	Well being	Existing brownfield land occupation (% of existing brownfields area for each IRIS/ total area of agglomeration)	Any kind of Brownfield	It is assumed that the more brownfield sites there are over time, the less attractive the land may become, and the higher the potential for brownfield emergence may be.	local (neighbourhood/IRIS preferably)	urban documents such as the SCOT	No local daset that specifically map brownfields as definded undr CABERNET. Hower, it can be obatined from mapping existing brownfields using corine land civer, local urban documents such	This indicator was chosen as data is available. It is also assumed that it may be one of the facors for industrial Bf emergence.	BRGM/Stadt + discussions
22	Environment	Well being	Percentage of green area per inhabitant (m2/inhabitant)	Any kind of Brownfield	It is assumed that the less green area per inhabitant there is over time, the less attractive the land may become, and the higher the potential for brownfield emergence may be.	local (neighbourhood/IRIS preferably)	Obtain information from GIS datesets (PLU, aerial photos or Corine Land cover - urban green area n°141)	Corin Land cover datasets for 2000 and 2006 for each commune	This indicator was not chosen as no evolution between 2000 and 2006 within the "urban green area" category. It is also assumed that is not relevant for assessing	BRGM from looking into available datasets in France
23	Environment	Well being	Perception of contamination	Any kind of Brownfield	It is assumed that the higher the perception of contamination is, the less attractive the land may become, and the stronger the potential for brownfield emergence may be.	local (neighbourhood/IRIS preferably)	BASIAS	number of BASIAS sites for each IRIS	This indicator was chosen as it was possible to obtain the number of potentially contaminated sites for each IRIS within orleans. It is also assumed that it may be one of the facors for industrial Bf	HOMBRE (Ellen G. et al 2013)
24	Environment	Natural and industrial hazards	Natural and industrial hazards	Any kind of brownfie	It is assumed that the more hazards are known within an area, the less attractive it may become and the higher the potential for brownfield emergence may become.	local (neighbourhood/IRIS preferably)	local prevention plans available within each commune in France (PPRm, PPRi, PPRt, etc)	We did not look into this indicator not enough time to retrieve relevant information	We did not look into this indicator not enough time to retrieve relevant information	BRGM
25	Governance	national politics for military defense	Defense politics	military brownfields	It is assumed that themore restriction there may be in military defence and military site, the highest the potential is for military borwnfield emergence.	agglomeration	Look into the evolution of the maintenance budget for military sites, debts, and overall budget over a year	We did not look into this indicator not enough time to retrieve relevant information	We did not look into this indicator not enough time to retrieve relevant information	BRGM

Appendix B– Anticipating BF emergence: indicators for which data was available for the French and German case

Summary of indicators to integrate into the BOWET help files

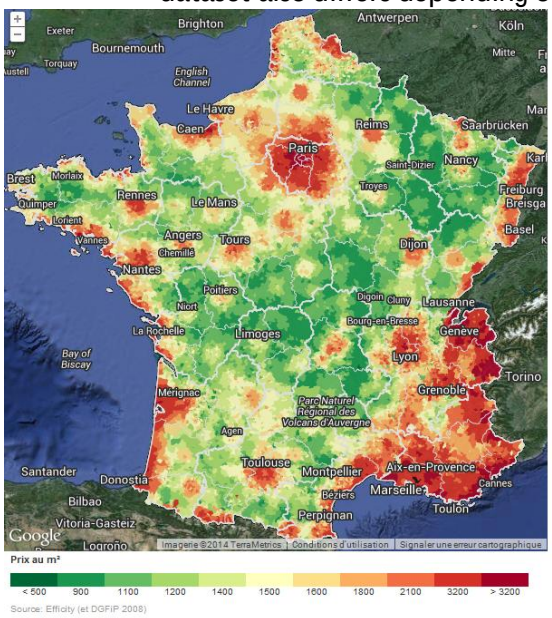
	category		Initial 7 indicators for French case with relevant data	Final 4 independent indicators for French case	8 indicators for German case with relevant data
	Economic	Land Value	X	X	X
	Economic	Total of industries	X		
	Economic	Number of new industries	X		
	Environment	Perception of contamination	X	X	X
	Environment	Access to green space			X
	Environment	Discrepancies in land use	X		
	Social	Amount of already abandoned plots	X	X	X
	Social	Distance to the nearest highway	X	X	X
	Social	Average time to nearest highway or train			X
	Social	Population change			X
	Social	Population composition by age			X

Land value

Looking into land value should give an indication of market evolution. When considering real estate value, tracking the market price of land plots can help identify demand patterns over time. Low demand for land can point out to lack of attractiveness and investment incentive, implying a potential for brownfield emergence.

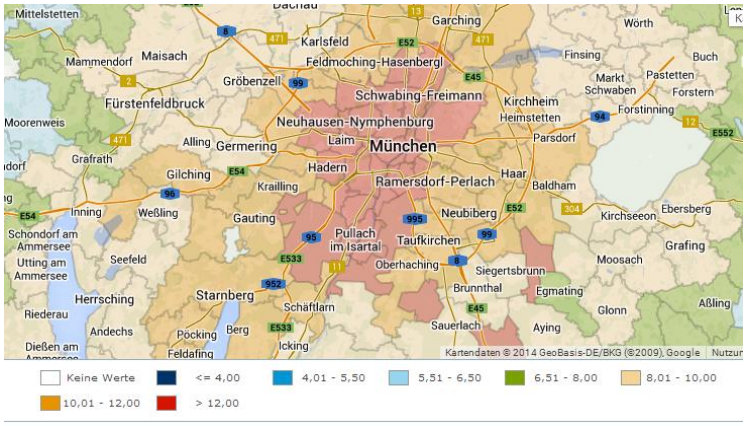
It is assumed that the lower the land values become, the higher the potential for brownfield emergence may be.

In France land value in euros/m^2 should be obtained from notary offices, urban agencies and estate agents. This indicator can also be assessed indirectly using publically available online datasets such as efficity.com, where property prices/m^2 can be obtained for specific areas. The resolution of the dataset will differ depending on the data sources. In Germany land values in Euro/m2 can be obtained from the responsible "Gutachterausschuss" (Committee of Valuation Estimation) office in the region, city officials, real estate agencies or public data sources such as immobilienscout24.de. The resolution of the dataset also differs depending on the data sources as is the case of France.



Property price per urban unit– Euros/m2 can be retrieved from the French website efficity.com

Source: efficity.com ;



Land value per urban unit– Euros/m2 can be retrieved from the German website immobilienscout24.de
Source: immobilienscout24.de

Discrepancies in land use

Comparing types of land use from one urban area with adjacent areas can highlight discrepancies and therefore point to the overall attractiveness of the area for all types of users alike. In general discrepancies can occur when an activity is not located adequately with respect to the overall land use, i.e. when there is a massively conflicting land use" (e.g. isolated industry within a residential area).

It is assumed that the higher the discrepancy in land use is, the less attractive the land may become, and the stronger the potential for brownfield emergence may be.

As it may not be possible to obtain such readily made available datasets, this indicator can be assessed indirectly using French national statistical data sets at the IRIS level (French national statistical institute - INSEE - datasets). IRIS are the smallest geographic units of the INSEE institute. For example, the ratio of number of industrial activities listed versus the number of main residential area being listed can be easily retrieved for IRIS known with important residential land use. In this case, the highest the ratio is, the less attractive the land may become for industrial activities, and the stronger the potential for brownfield emergence may be.

	Number of listed industrial activities	Number of main residential listed areas	Ratio
IRIS 1	2	356	178
IRIS 2	38	24	1
IRIS 3	22	890	40

Example of industrial land use versus residential use ratio to assess discrepancies in French IRIS with important residential land use – source: INSEE

Example of an industry within a residential area Source: Ouest France

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Total of operating industries

Looking into the total number of operating industries within specific urban areas should give an indication of the area attractiveness. From the evolution in the number of industries over a period of time, municipalities may sense whether any out-migration of the industry is happening or not and evaluate the possibility of dereliction.

It is assumed that the less industry there is, the less attractive the land may become for further businesses, and the higher the potential for brownfield emergence may be.

In France, this indicator can be assessed using national statistical data sets at the IRIS level. French national statistical institute - INSEE – SIRENE enterprise demography dataset). IRIS are the smallest geographic units of the INSEE institute.

	Evolution of the number of listed industrial activities over the 2009-2012 period
IRIS 1	0%
IRIS 2	0%
IRIS 3	-15%

Example of number of industrial activities listed per French IRIS – source: INSEE

Number of new industries

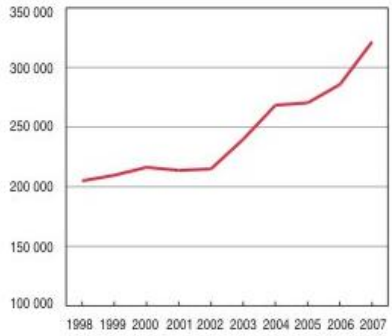
Looking into the total number of newly created industries within specific urban areas should give an indication of the area attractiveness. From the rate of industries creation over a period of time, municipalities may sense whether any out-migration of the industry is happening or not and evaluate the possibility of dereliction.

It is assumed that the more new industries there are being registered, the more attractive the land may become for further businesses, and the lower the potential for brownfield emergence may be.

In France, this indicator can be assessed using national statistical data sets at the IRIS level (French national statistical institute - INSEE - datasets). IRIS are the smallest geographic units of the INSEE institute.

	Evolution of the total number of newly created industries over the 2009-2012 period
IRIS 1	0
IRIS 2	-100 %
IRIS 3	+250 %

Example of number of newly created industrial activities listed per French IRIS – source: INSEE



Example of the total of newly created industries between 1998 and 2007 – source: INSEE

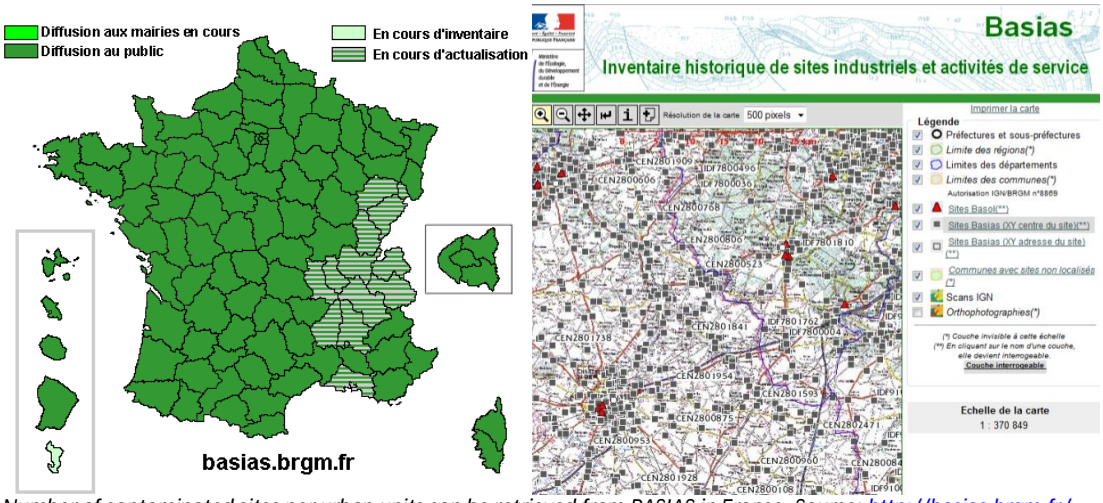
Perception of contamination

Looking into the perception of contamination by the population or other users such as industries can point out towards the overall perceived environmental quality that is offered by an area. It can highlight the overall attractiveness of the area for all types of users alike. In general the formal industrial land use of a plot can indicate a potential for historic land confirmation.

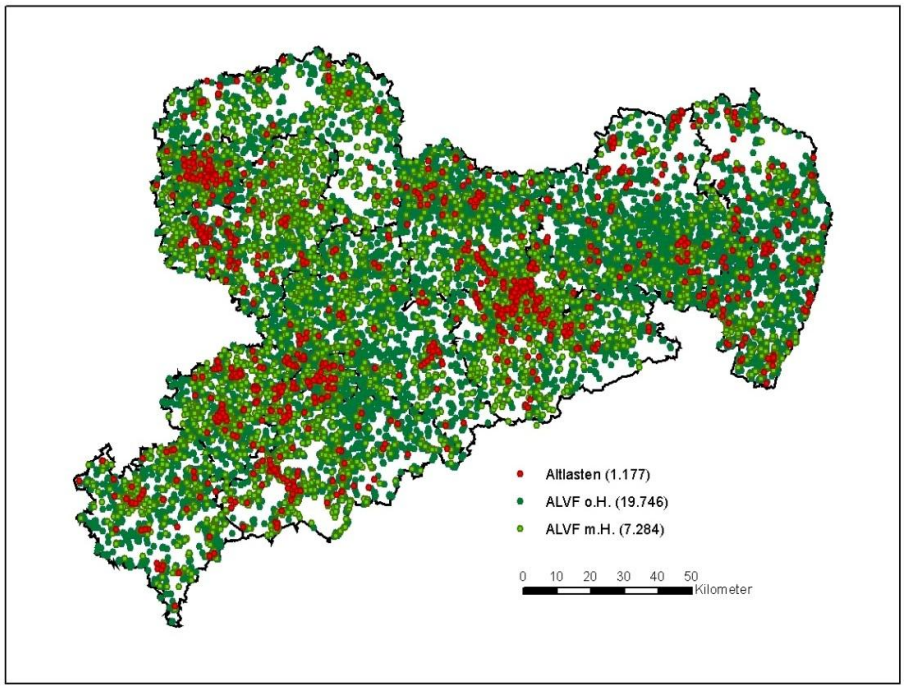
It is assumed that the higher the perception of contamination is, the less attractive the land may become, and the stronger the potential for brownfield emergence may be.

When it is not possible to carry out door to door surveys on perceived contamination, such indicator can be obtained indirectly from national data sets listing potential or existing contaminated sites. Such national database

exists both in France and in Germany (BASIAS, BASOL in France, Altlastenkataster (Register of Contaminated Sites) in Germany). Furthermore, the former presence of industrial sites on a property can indicate that contamination may potentially exist on site. This information may be accessed in Germany from official city documents.



Number of contaminated sites per urban units can be retrieved from BASIAS in France- Source: http://basias.brgm.fr/



The location and amount of contaminated sites can be taken from the Register of Contaminated Sites of the different states in Germany (pictured – confirmed (red) and potentially (green and light green) contaminated sites in the German State of Saxony) (http://www.umwelt.sachsen.de/umwelt/boden/12478.htm)

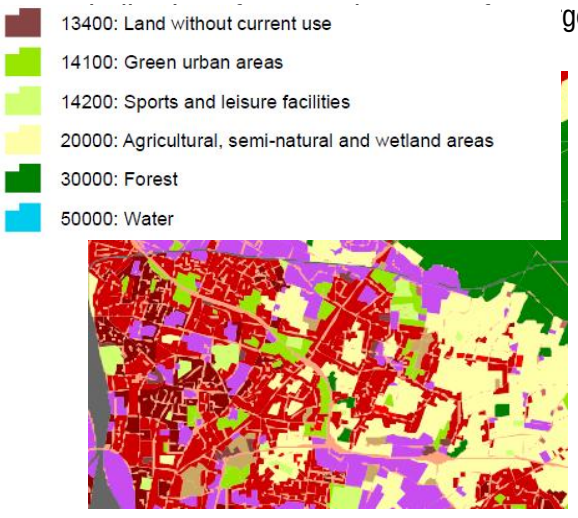
Access to green space

Green areas in urban areas increase the overall livability and contribute to the quality of life in a locality. A lack of green areas of a certain quality can be a warning sign for a negative development on a site. Although, it may not have a direct impact, it can be expected to have a negative influence on the long term. In the case of significant urban redevelopment, rapid addition of green space can be expected to skew the potential for any brownfield development and provide information on an area attractiveness.

A green space and a parking lot which were created on a former brownfield site. It is expected that the concentrated efforts of such activities can skew the access to green space indicator by ranking districts with adequate green space as lower than areas where heavy restructuring has taken place.

It is assumed that the less green area per inhabitant there is over time, the less attractive the land may become, and the higher the potential for brownfield emergence may be.

In France as well as in Germany the evolution of green area over time (percentage of space area) should be obtained from local authorities urban planning documents. The European urban atlas dataset can also provide [illegible] ge Urban Zones with more than 100.000



Example of green urban areas - Source: Urban atlas

Brownfield land occupation

Existing brownfield sites or derelict land in urban areas decrease the overall attractiveness of a locality. The increase in the number of brownfield sites or their long term occupation of the land can be a warning sign for negative development within an area. Although, it may not have a direct impact, it can be expected to have a negative influence on the long term.

It is assumed that the more brownfield sites there are over time, the less attractive the land may become, and the higher the potential for brownfield emergence may be.

The number of brownfield sites per area can be obtained from listing and then mapping existing (using on site surveys or the urban atlas database). In Germany, the vacancy rate can be obtained from official city documents where on-site analysis of the vacancy situation has taken place. Brownfield occupation can be assessed using the ratio of the percentage of brownfield occupied area versus the total urban area

	Brownfield occupied area (ha)	Total urban area being considered (ha)	Ratio (*1000)
IRIS 1	11,3	2748	4
IRIS 2	0	2748	
IRIS 3	0	2748	

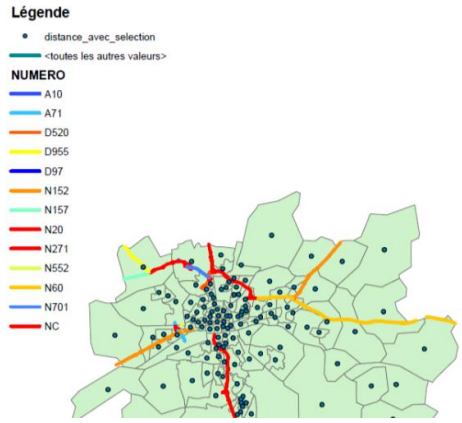
Example of brownfield land occupation within French IRIS – source: INSEE

Distance to nearest highway

Brownfield are likely to appear when the designated land us in specific locations become less attractive from a social perspective. Lack or absence of services provided to the community may impact on brownfield emergence.

It is assumed that the longer the distances to nearest highway are from specific urban areas, the less attractive the land may become, and the higher the potential for brownfield emergence may be.

It is possible with satellite imagery and publically available mapping services to calculate the distance of specific urban areas to the nearest highways or train stations.



Example of GIS data use to retrieve distance from each IRI to the nearest major highways or A roads. - Source: BRGM

Average time to nearest highway or train

This indicator should give an indication the total level of interregional accessibility of the districts by taking into account two major modes of transportation: train and car. Accessibility plays an important role in the location of various urban uses and brownfields are more likely to develop in areas which are hard to access from these networks.)

It is assumed that the longer it takes to travel on average from one area to the nearest highway or train, the less attractive the area may become, and the higher the potential for brownfield emergence may be.

It is possible with satellite imagery and publically available mapping services to calculate the distance of specific urban areas to the nearest highways or train stations.

Population change

This indicator should give an indication of the local effects of demographic change and where brownfields may occur due to a decreasing population.

Amount of Residents						
UU	Base Year	Most Current year	Relative Change		Yearly Change (10 yrs., rounded)	
1	2703	2178	-525	-19%	-52,5	-2%
2	563	942	379	67%	37,9	7%
3	3412	3165	-247	-7%	-24,7	-1%

An example of data related to the population change of three urban units. Source: Stadt+

It is assumed that the higher the rate of population decline is in a certain district, there is a higher amount of potential brownfield formation.

In Germany, the rate of population change can be obtained from national and state level datasets as well as from independent research foundations (Bertelsmann Foundation). Data on the development of local level districts can be obtained from official city documents.

Population composition by age

This indicator should give an indication of the potential of brownfields which may arise on the long term due to future natural population loss. The older the population composition may become, the higher the chances are that the households in which older residents live may become vacant in the future.

Relative Change per Age Group					
UU	≤ 18	19-30	31-50	51-65	> 65
1	-31%	-25%	-6%	-25%	-1%
2	35%	17%	83%	25%	-10%
3	-74%	-84%	-13%	-6%	15%

An example of data related to the population composition of three urban units. Source: Stadt+

It is assumed that districts with a growing population composition of elderly people in relation to younger generations have a higher potential for brownfield formation.

In Germany, the data on the changes of population composition can be obtained from national and state level datasets as well as from independent research institutions (Bertelsmann Foundation). Data on the development of local level districts can be obtained from official city documents.

Appendix C – Anticipating Brownfield emergence – the initially 16 selected indicators for the German case

Indicators shown here in italics were not selected for the evaluation of the urban units.

Main Indicator	Reason for Choosing Main Indicator	Sub-indicator(s)	Specific Case in Meerane
1.1 Real Estate Value of Area	Tracking the market price of land plots can help identify demand patterns. Low demand for land is an indicator for a lack of investment incentive and the potential emergence of BFs.	1.1.1 Industrial	It is possible to get district specific information in Germany on the value of land plots. These are overall values and are not split into different land uses.
		1.1.2 Commercial	
		1.1.3 Service	
		1.1.4 Residential	
		1.1.5 Other	
3.1 Accessibility	Accessibility is important for the vitality of a district.	3.1.1 Average access to nearest highway or train	It is possible with satellite imagery to calculate the distance of a district to the nearest highway or train station. Meerane is serviced by one main train station as well as a national and regional highway.
		3.1.2 Weight capacity and height of bridges	*Not relevant for the case of Meerane*
		3.1.5 Public transportation	Meerane is serviced by six bus lines.
		3.1.6 Distance of the quarter to the nearest highway	*Already considered in sub-indicator 3.1.1*
4.1 Environmental Quality	The environmental quality found in a district can point to the attractiveness of the district for residents and users alike.	4.1.1 Percent of change in the areas green space	Significant city restructuring measures undertaken in Meerane has added a significant amount of green space to the city. This rapid addition of green space is expected to skew the ability of the indicator to reflect the potential for BF development. Instead, the existing amount of green space today can provide information on the quality of the district to retain users and prevent brownfield formation.
		4.1.2 Confirmed (or potential) land contamination	The former industrial land use of a plot can indicate there is a potential for land contamination. Databases for land contamination are available in Germany.
5.1 Welfare of the Population	Population structures can strongly affect the potential for BF emergence.	*5.1.1 Architecture fits to the regional context*	*Requires extensive on-site analysis*
		5.1.2 Activity complies with neighboring uses	*Requires extensive on-site analysis*
		Average age of the residents/Average amount of people per household	*The information is not available for each urban unit*

		5.1.3 Amount of already abandoned plots in the area (vacancy rate); Population change; Population composition by age	The information is available for Meerane for each urban unit for the years 1990, 2006 and 2014.
6.1 Condition of the Real Estate	Poor real estate quality can greatly raise the risk of brownfield emergence as a building becomes unsuitable for use.	*6.1.1 Age of the real estate or the last renovations*	*Requires extensive site analysis*
		6.1.2 Condition of or need for energy retrofitting	*The information not available for each urban unit*
		6.1.3 Incompatibility of current use with the initially planned use	*Requires extensive on-site analysis*
7.1 Knowledge of Risks	This indicator is important for cities in Saxony where there exist a general threat of flooding from the Elbe and other rivers in the State	*7.1.1 Knowledge of risks (Environmental)*	*There is no pertinent risk of flooding from river overflow in the case of Meerane*

Appendix D – Anticipating Brownfield emergence – collected data and ranking method for the German case study

The data collection and ranking were carried out before the consultations.

Indicator	How was data gathered?	How was the indicator ranked?	Initial weighted value
Land Value	Data is collected by regional and local authorities. The city was able to procure historical land value data from 2006, 2008, 2009 and 2012 (most current).	The ranking of this indicator was based upon the existing land values, where the top value would represent the best and the lowest value the worst score (five classes were proposed)	20%
Development of green space	Official city documents such as the local Land Use Plans from 1992, 2007 and 2014 (most current draft version)	The allocation of green space in the Land Use Plans from 1992, 2007 and 2014 were evaluated to determine the level of development (five classes were proposed).	5%
(Potential) land contamination	Official city documents such as the City Development Concept of 2007.	The amount of previously industrial uses was counted and ranked for each of the urban units (five classes were proposed).	5%
Distance to the nearest highway and train	Satellite imagery was used to calculate the distance between the centre of the urban units and the next connection to the highway systems (B 93 and A 4) or main train station.	Access to the train station and highway system was weighted according to the distance required to travel to the next access point (five classes were proposed).	5%
Access to public transportation	Webpage of the local transportation authority	The amount of bus stops (only public transportation mode in Meerane other than train) where counted for each urban unit as well as the number of lines that serve them (five classes were proposed).	5%
Population Change	Official city documents such as the City Development Concept of 2007 and more recent data from 2014.	The development of the urban units were compared to each other (five classes were proposed).	20%
Population composition by age	Official city documents such as the City Development Concept of 2007 and more recent data from 2014..	The ageing of a urban unit was seen as a risk of further brownfields showing up in the future (five classes were proposed).	20%
Amount of already abandoned plots	Official city documents such as the City Development Concept of 2007 and a on-site analysis of the vacant buildings.	The amount per urban unit was compared to each other and ranked (five classes were proposed).	20%

Appendix E – Minutes Genoa workshop May 2014

Participants:

A total of 19 stakeholders attended the workshop. 6 stakeholders participated on the working session to test the Brownfield navigator (BFN) and the Opportunity Matrix (OP).

STAKEHOLDERS:

- Genoa Municipality: 5 attendees: (Mayor of Genoa, Vice-Mayor and City Planning Councillor, Town Council President, Environment and Parks Councillor, Public Servant)
- Medio Ponente Borough: 4 attendees
- Local stakeholder working group: 10 attendees
- HOMBRE: 5 attendees from PN studio (Italy), Deltares (Netherlands), Acciona (Spain)

The workshop was in Italian and presentation and discussions were translated during the meeting. The stakeholders were prepared beforehand so they had already a certain level of knowledge about the project and tools.

Agenda:

Wednesday 28th May:

09:15 Workshop registration

09:30-10.30 Welcome from the Mayor of Genoa, Environment and Parks Councillor, Medio Ponente Borough President, and presentation of the Working Group (stakeholders)

10:30-12:30 Plenary presentations to introduce Hombre project
Overview of HOMBRE project
Brownfield Navigator
Opportunity Matrix

13:30-14:00 Fieldtrip to Campi Shopping and Business Center (Brownfield redeveloped)

14:00-16:00 Working session in groups to test/go through BFN and OM simultaneously

16.15-17:15 Plenary feedback/Discussion

17:30 Closing

Minutes:

Wednesday 28th May

- Welcome

Mayor of Genoa explained that the city of Genoa is under transformation with the aim of recovering industrial areas. He was very interested in the HOMBRE content and he considered that Brownfield Navigator (BFN) is a useful tool for decision making from the sustainability point of view.

Environment and Parks Councillor, considered that BFN is an innovative tool for BF regeneration from the economic and environmental point of view. She thanked HOMBRE project for the unique opportunity of testing the BFN in the city of Genoa.

President of the municipality of Cornigliano, explained that Cornigliano area has been transformed and the HOMBRE project is completely related with the activities

performed by the working group of Cornigliano. The working group, local stakeholders and "BF manager" of the municipality presented their work.
Borough Environment Councilor and previous coordinator of the "Cornigliano working group", explained the evolution of the area. Cornigliano was an industrial area. After a strong intervention of the local communities, in particular "Women of Cornigliano" the asked a better environment, in 1999 the industrial activity it was stopped, and in 2005 the factory was demolished and it was decided to regenerated the area. In 2007 "Cornigliano working group" was created in order to look for different regeneration alternatives.

- HOMBRE Project Overview

Presentation of the HOMBRE project: aim of the project and some examples of BF regeneration (Balearic Islands: hotels and Residential and was regenerated by tourism). Introduction of the BFN, as a methodological tool to support decision making for the regeneration of derelict areas. BFN gives scenarios not final solutions. BFN is organized in 3 steps: prevent the BF, make the transition and evaluate the change. Together with the BFN, the opportunity matrix is a tool that describes the possible interventions to different services for BF regeneration.
The aim of the workshop is to get feedback from the stakeholders about the BFN and OM, both tools are still being developed.

- Brownfield Navigator

Presentation of the BF Navigator to the stakeholders. It is possible to store the information and decisions, discuss with stakeholders different alternatives and different techniques for BF regeneration. The land use cycle is presented, early warming indicators (environmental, economic and social indicators), planning phase, and check the performance phase (different scenarios and check if we have got what we expected). The BFN includes different items and tools: eg map and sketch functionality, example database, regulation check list and a library with information.
Questions:
One person asked if it is necessary to verify the access. It was explained that everybody can use the BFN with their own session, it is only necessary create a session and password and it can be saved online. Also data can be downloaded offline and removed of the online session.
Is it possible to use the tool for improve or regenerate a green area (agriculture) that is not a BF but is underused? The HOMBRE project does not focus on agriculture areas, but on industrial areas (urban context), however, it can be used and extended for other topics.

- Opportunity Matrix

Presentation of the opportunity matrix. Opportunity matrix (OM) is a tool that allows stakeholders to examine soft re-use possibilities in the regeneration. OM is focused in soft-end uses and he presented some examples: wetlands, biomass production, soil remediation, etc… These examples have additional benefits, such as CO_2 fixation, temperature control. OM consist of a matrix with services at one side and interventions at the other. Interventions are the techniques/methods to eventually provide the services. OM may change depending on the needs.

- Discussion

The HOMBRE project and tools presented shows clear improvements for decision making and it would have been very useful to have had this tool 7 years ago when they started with the regeneration of Cornigliano area. They would have saved time.
The general opinion is that the idea of the tools is clear but to put them into practice and how to use the tool is probably complicated. Advise: make it simpler for stakeholders.
OM data sources: The matrix is generated with examples, (North-West) European experience. Could it also be filled with East-European or Mediterranean examples?
Future of HOMBRE project: 2014 is the final year of the project. There are some ideas for the future of HOMBRE (HOMBRE+). Deltares will host the BFN. Within the HOMBRE context the first BFN development will be finished and then the idea is to find other projects, stakeholder's interest and update the BFN. Possibility of adapting the tool for more specific situations and countries. Now it is quite generic.

- Testing the BFN

The ambitions and societal demands were defined by the "working group of Cornigliano". It was interesting that stakeholders used the service guide for the opportunity matrix to inventory their ambitions and we recorded them with the vision-ambition tool in the BFN. It was handy for stakeholders to have a list with services for inspiration and it would be possible to make the service list broader (not only for soft reuse) with some examples and couple it to the tool in the BFN. Service guide used during the workshop is presented in Table 1.
The most important social challenge for the working group is Human well-being and health, better quality of life and second is tourist attraction (foreign and local) and they are not interested in increasing the land price that means more expensive homes. According to this, different ambitions were defined (Figure 1). It was a little bit difficult to match the ambitions defined from the service guide to specific social challenges in the vision-ambition tool.

Table 1: Services guide

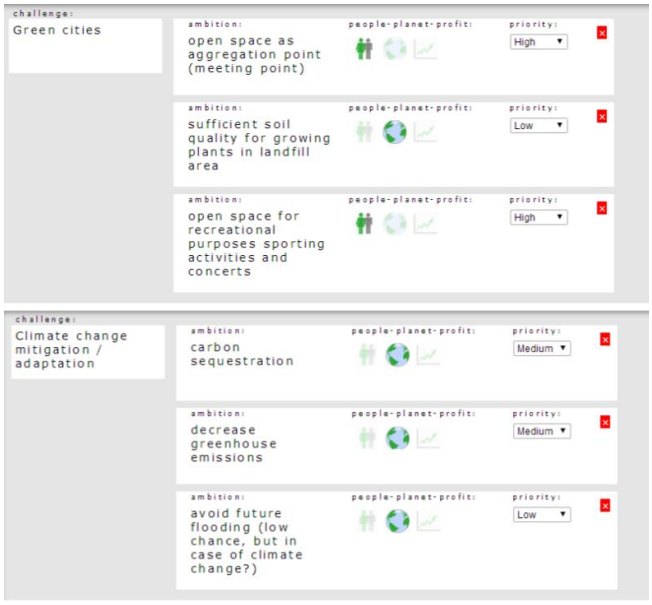
What are you looking for?		More detailed ambitions
Society and economy		
Ambition: A liveability improvement in the area. Ambition: Economic development of the area.	Group: Socio-Economic Benefits	I want to create open space. I want to create recreation possibilities. I want to create educational elements. I want to attract tourists. I want to improve health and well-being for the neighborhood. I want to generate jobs. I want to increase the land and area value.
Sustainability		
Ambition: Compensation of global warming. Ambition: Sustainable energy production.	Group: Mitigation of Human Induced Climate Change (global warming)	I want to produce sustainable energy for the Brownfield and/or it surroundings. I want to produce bio-fuel, gas, or plastics. I want to grow or breed something while re-using organics. I want to sequester carbon. I want to decrease greenhouse gas emissions.
Nature & Green elements		
Ambition: Green elements for people or ecosystem. Ambition: Nature and liveability for the living environment.	Group: Provision of Green Infrastructure	I want to protect existing habitat and biodiversity. I want to develop habitat and increase biodiversity. I want to improve air quality. I want to decrease noise. I want 'green' looks in building environment. I want to cope with flooding, heating, and water shortage effects.
Water management		

Ambition: To optimise water quantity (too much, too little water). Ambition: An efficient water re-use.	Group: Water Resource Improvement	I want to recharge the groundwater or store water at the surface. I want to protect from flooding or decline runoff. I want to re-use waste water.
Productive Soil		
Ambition: To improve the soil quality for 'soft use'?	Group: Soil Improvement	I want to improve nutrient dynamics, biological activity or soil conditions to grow certain crops/vegetation. I want to improve soil resilience, provide vegetation cover or prevent soil erosion.
Clean environment		
Ambition: A cleaner environment for people and ecosystem.	Group: Risk Mitigation of Contaminated Land and Groundwater	I want to protect the human environment and ecology from pollution in soil and groundwater. I want to protect surface water and groundwater from pollution.

Following the service guide the ambitions are described as follows:

- Society and economy:
  - To create open space for recreational purposes and sports
  - More structures for education and culture
  - To attract tourists.
  - To improve health and well-being for the neighborhood.
  - To connect the area with the sea and river.
- Sustainability
  - To sequester carbon.
  - To decrease greenhouse gas emissions.
- Nature & Green elements
  - Open spaces for recreational purposes.
  - Decrease the noise
  - Increase biodiversity
  - Air quality
- Water
  - To avoid flooding because the river is very close (it could be an important problem in case of climate change)
  - Recharge ground water and use for leisure
- Soil
  - Part of the area was landfill→ possible agricultural use in this area
  - Not any industrial activity in the are

Taking into account the priority of the ambitions, human well-being and health is the priority. There were no ambitions defined on sustainable food production, resources efficiency and energy production. However, they are interested in avoiding contaminated areas now and for the future. The connectivity of the area with the sea had high priority. They are more interested in social improvements than economic change.



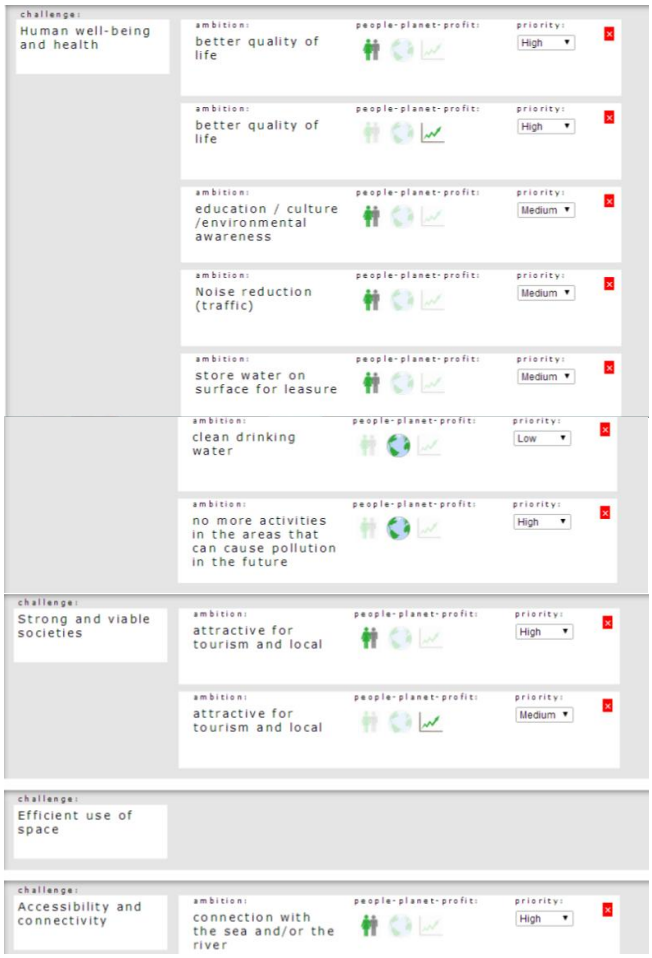


Figure 1. filled in ambitions in the Ambitions and social demand item of the BFN

The ambitions were related with the services defined in the Opportunity Matrix and the interventions connected. The colors and icons in the OM were explained by the HOMBRE team, but remained quite confusing. Some ambitions cannot be assessed with the OM at the moment (eg connectivity of the area with the sea), probably because of the focus on soft reuse.

Map and Sketching. The ambitions and proposals were designed in the map (Figure 2): Sport area and green area for concerts. Sport center, path way, bike lane, decrease the noise with a green area close to the railway, water ponds. Suggestion came to be able to calculate the area with the BFN (it is not possible (yet)).

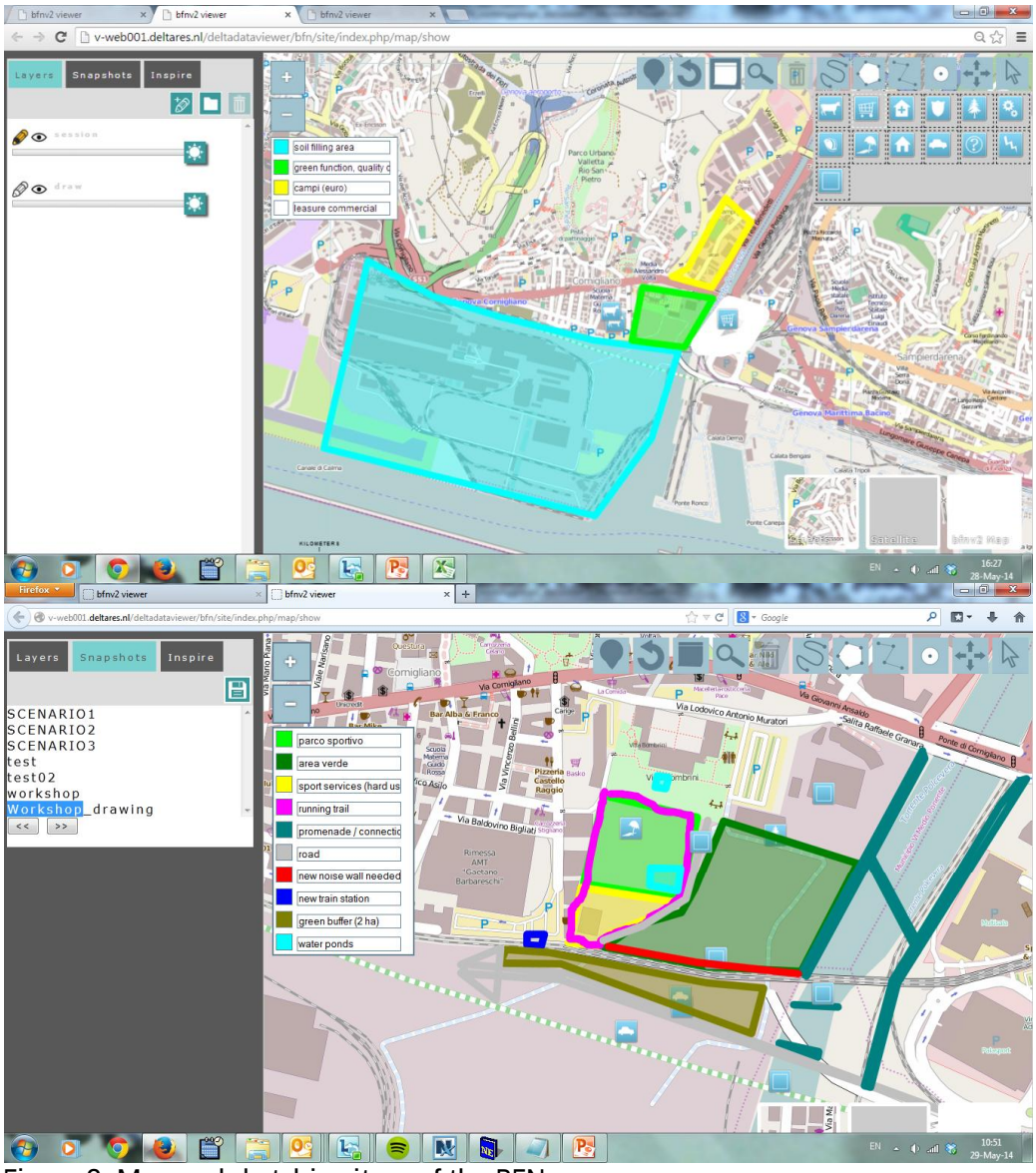


Figure 2. Map and sketching item of the BFN

The Biomass Flowchart was also tested for a green area (Figure 3).

Figure 3. Green use flowchart item in the BFN

- Feedback and final comments from the Stakeholders

The coordinator of Cornigliano Working Group (Borough Participation Group) had expected a more 'technical' tool, harder to understand and use. On the contrary he is pleased because 90% was easily understood about BFN and OM. He expected a better resolution in drawing, or something 'more tangible', probably with a touch screen it would be more involving (Note: it is possible to use it on a touch screen eg tablet / design table). For example, if the sketch produced during the workshop would be showed to the Mayor, it wouldn't be understood or appreciated. (Note from PNstudio: (on esthetics): it is an innovative tool, primarily to be used to support the process to come to designs together with stakeholders. Not a tool with the objective to make attractive looking designs for presentation.) Anyway he thinks that example library, in particular regeneration cases of success, are very useful in this case, to give a suggestion of which kind of interventions are needed and the potential results.

It is suggested to integrate to BFN maintenance costs of different land use deriving from interventions indicated by OM: maintenance costs of a park, or of a green buffer, etc.. (note: this will not be realized within the HOMBRE project, perhaps possibility for HOMBRE+, country specific).

<u>BF Navigator</u>

- Easier to use than expected, explanation was clear and helped to better understand the BFN.
- Question on sessions: sessions for others accessible? Own password, own session, you can download all your information to own computer and upload it again when sensible info you don't want online.
- They suggested improving the aesthetics of the final product to present to the politicians. Aesthetics of end result: expectation management. BFN is a discussion tool not meant for presentation. Make artist impression for presentation. Nicer presentation can help in discussion.
- BFN is different than what people are used to. Push to face with other stakeholders from the beginning is not so common. BFN makes exchange easier between different kinds of people. OM is example is meant for expert, made by experts but does not work with stakeholders in this form. Make every part of BFN very easy to handle. As a synthesis. Nice to look at, good to comprehend. First sight appealing, and then you can go to a more detailed version. Go deeper. Fits by bottom up solutions. BFN possibility for democratic tool.
- Example library very important
- Using interactive design table is better than beaming it with a moderator. More active involvement / use.
- Check reality of the map. (the map was not completely right location of roads)
- They suggest a rendering function, 3D pictures, and animations to improve the image in order to impress politicians.
- Wish to add Costs: maintenance costs/cost for different for land uses (country specific). Modular tool, this can be implemented later on in custom made versions of BFN. Eg make a list with what kind of costs you can expect instead of giving actual costs
- Calculate area dimensions of drawings / Present some parameters in drawing?

Opportunity matrix

- The Service Guide might be very well combined with the BFN ambitions part.
- Less rows and columns. Too much information for one screen. Works for desk study not when it is used for a group on a beamer (does not fit 1 screen).
- It would be useful to make a simplified version for stakeholders. First inventory and then go on with detailed info.
- Names of the cells description must be easier: ISICS/HLOW. Even other simpler names (opportunity windows) is too difficult
- Too many colours and icons in the matrix.
- Rewrite first few sheets in presentation: expectation management
- It takes too much time to explain the OM to the public (motivated and beforehand informed public)
- Links should work
- More region related information:
    - Split up the O.M. in climate regions
    - Split up for urban rural coastal areas
- Connectivity is not addressed in the OM (connection to water/sea. Add in green infrastructure part)

Green use tool

- Rename Green use tool to biomass tool.
- Make possibility to save biomass flowchart and edit it.
- Change “stop”.

Appendix F – Minutes of the Golden Question Workshop HOMBRE Technology Trains Solec Kujawski

Text in this deliverable is taken from HOMBRE deliverable 4.4 (Smit et al, 2014)
Minutes of the Golden Question Workshop HOMBRE Technology Trains Solec Kujawski (18 september 2014)

The Golden Questions were tested by organizing a workshop on 'Golden Questions at Solec Kujawski' in Poland in September 2014. Below the set-up of the Solec workshop is presented as well as the evaluation of the workshop. The goal of the workshop was to test: What is the relevance and applicability of the GQs for the Solec Kujawski case? The Solec Kujawski case was chosen as in this city with about 16.000 inhabitants a former wood preservation site is at the moment recultivated according Polish legislation. For this soil-washing of the creosote contaminated soil is occurring. This recultivation will continue in the coming two years and is financially supported by EU funding.

Set up of the workshop

- Programme of workshop
- Presentation on example
- Discussion lead by moderator in Polish
- Evaluation upon GCs by stakeholders
- Evaluation Workshop approach by HOMBRE team at the Workshop
- Outcome and recommendation for future use of GQs Workshop

Programme Golden Question Workshop HOMBRE Technology Trains Solec Kujawski

The programme of the Golden Question Workshop Program, HOMBRE Technology Trains, (7 FP EU), Poland, Solec Kujawski,18. September 2014 is presented in appendix 2. The list of participants and of the HOMBRE team are presented below (Appendix 3):

Participants:
Deputy vice-Major,
Director Forest district,
Areal protection agency,
Maintenance department Solec Kujawski,
Director History museum Solec Kujawski,
Communication officer Solec Kujawski,
Head regional centre for investments,
Bydgoszcz Municipality / AB Member of HOMBRE Project),

HOMBRE team: Four people from the HOMBRE team were present, from GeoLogik and AGH University from Poland two people from Wageningen University, The Netherlands.

1. Introduction workshop

The meeting started with a presentation on the BF redevelopment at the Utrecht-case upon the use of the combination of Aquifer Thermal Energy Storage (ATES) and bioremediation to tackle the groundwater contamination and to produce sustainable thermal energy. Emphasis was not on the technology train as such, but on the function of the Golden Questions that can be used to structure a discussion on how to discover hidden values at a specific BF site. Therefore the two strategies on how to implement new technologies either via 'technology push' or via 'technology pull' were stressed. Also as an example all Golden Questions were addressed to the Utrecht case (see for details D4.3. Smit, 2014-I).

Thereafter Wojciech Irminski moderated the discussion in Polish upon the Golden Questions which were presented in a bi-lingual presentation on the screen (see Appendix 4. Meanwhile Greg Malina functioned as interpreter to inform Martijn Smit and Tim Grotenhuis upon the specific issues that were addressed at each Golden Question. A summary of the topics of importance were noted in short on 'flip-over' charts.

The Workshop generated interest with the local TV broadcasting and the local newspaper.
Before the workshop the workshop-moderator was interviewed by TVS = TV Solec for a TV programme that is broadcasted in the first week of October. The main topics were: why HOMBRE Team is organising the third time a meeting in Solec Kujawski? What are the Golden Questions and why can they be important by Brownfield management? How is the EU HOMBRE Project connected to the current remediation works on the abandoned wood preservation manufactory in Solec Kujawski and what is the state of progress of the remediation work?
An another dissemination sign of HOMBRE in Solec Kujawski is the short news with picture made during the HOMBRE workshop – the news is posted in the local newspaper "Soleckie Wiadomości z Ratusza" (Solec's News from City Hall) on 26 September.]

2. Evaluation upon Golden Questions by stakeholders

The participants in the Solec Workshop recognized the Golden Questions as a systematic approach to discuss the BF issue. They stated that in their own approach till now they implicitly followed a similar approach. The Golden Questions and their own approach have in common that they are in essence based upon 'common sense'.
By performing the discussion in this structured way by using the Golden Questions and a moderator, they realized that the term Brownfield has a much broader meaning than they were using before in their discussions upon the wood conservation site.
The stakeholders in the workshop expect that the Golden Questions will lead to a better planning of the redevelopment plans at Solec Kujawski. Also they are aiming at to use these questions in future discussions in which the redevelopment will be worked out in more detail.
Further they stated that in a Brownfield redevelopment planning a retrospective approach as is done with the GQs is essential anyway to come to a good quality redevelopment. Such retrospective approach will avoid making the same mistakes as made in the past and may help to avoid the creation of new future Brownfields in future.

The stakeholders liked the workshop as it was dealing with a real existing case. In other workshops they had to deal with hypothetical cases, which were experienced as less concrete and therefore less relevant.
The participants put forward that: To avoid generation of new BFs is a big challenge for society. However at the end of the Workshop the participants were convinced that for the Solec Kujawski case it will be possible to make a success from a problem.

3. Evaluation Workshop approach by HOMBRE team at the Workshop

During the workshop notes were made by the observers. The moderator made notes on the flip-over during the discussion at each Golden Question.
In a two hour meeting this information was discussed and partly translated from Polish to English. The precise translation of the flip-overs was worked out a few days later.
Please find below the main topics that were discussed for the Solec Kujawski case at each Golden Question:

GQ1: What are the problems of the Brownfield?
Surprisingly the discussion did not focus to the most contaminated site as such (where creosote was used for the conservation of wood), but the non- fitting of the legislation to the solution of the problem was experienced as a much more important problem. One of these problems is that after the remediation phase has ended, the Polish law forbids re-using the area in an economic way in the following five years. Therefore relatively long the participants discussed rules that do not fit to the approach of the site. Further, it is recommended that, if you want successful discussion, start with showing people that there are not only problems, but stress also that probabilities may occur to solve the problem. This is an important role for the moderator of the workshop. (Think as: glass is half full ...). It is important to create an atmosphere in which it becomes clear that problems can create opportunities. It was experienced that starting the discussion with 'problems' at the site was easy, as people recognized the topics that were addressed.

GQ2: What are the ambitions for this specific area and its surroundings?
Thinking in ambitions was rather new to the participants. Early in the discussion the only recognized ambition was to develop sports and leisure activities at the BF site. It could be stated that this was a rather narrow ambition.
However in fact they had hidden ambitions that were not directly related to the Solec case upon redevelopment at a larger scale. During the discussion participants realized that the start of the redevelopment could initiate more developments like using the waterfront of the Vistula river for future developments like harbour for recreation, as well as shipping activities for goods. However this is also dependent upon measures taken on a higher level (region/ nation) on the nautical development of the Vistula river.

In relation to the HOMBRE project and especially Work package 4 we were interested in the ambitions upon basic needs energy, water and materials. The participants were not especially focused to these basic needs as their ambitions were especially economically driven, the basic needs only serve these economic drivers. The economic drivers that were stressed include: good location offered by the city, good transport facilities. For the basic needs the following remarks were made:

Energy:
The attention for energy is of less importance at the moment. There was interest in PV panels of the roof of a school, however the stakeholders realized that the energy production was maximal in summer time by these PV cells, whereas at that period the students are not at school as they are celebrating holidays. Further these PV cells were far too expensive yet.
Water:
For the production of wood in the region there is and increasing shortage of water in the last decade. Within the view of climate change the building of water reservoirs was proposed by one of the participants, however at this moment the pressure on water shortage was not urgent enough.
Materials from Soil:
The use of soil for building material is not interesting now, as enough building material (sand) is delivered already by the Vistula river, as can be seen from the company Solbet (producer of concrete) which is active in Solec. The Vistula is used as source of sand (dredging), which creates also better nautical properties of the river (synergy).
At the end of the discussion the following ambitions were noted:

- Localization of housing near sports area.
- Development of residential area
- City park
- Flooding protection from the Vistula river
- Turn the city to the river (as it was in the past)

GQ3: What can be supplied from the site that can fulfil the demands at the (re)developed site?
The participants could answer this question very rapidly. Starting from the specific creosote contaminated site it was stated that this specific area could be a good location for sports and recreational services. In the period 2000-2013 nearby the creosote location a swimming pool was built, it is aimed at to expand the sports and recreational area to the former wood preservation location. The flexibility in spatial planning was mentioned as an advantage and supply at the creosote site as well as around this contaminated area. At larger scale the location of the site as well as the location of Solec Kujawski is well positioned at the railway between Torun and Bydgoszcz, and the road S10 also between Torun and Bydgoszcz. So the location of Solec was regarded as rather good in view of transport facilities. Further the proximity to the forest area around Solec, and of to the Vistula river on the east site of Solec were recognized as potential supplies for the redeveloped site. These location aspects played also a role in the building of a radio-broadcasting transmitting station in 1999 and the creation of Jurapark in 2008, which exhibits over 100 prehistoric animals at real scale together with a the largest Polish palaeontology museum.

GQ4: How can the answers to questions 1, 2 and 3 be combined?
The original Golden Questions 4 is: How can technology trains support the development plan of the BF site in time and space?

In the preparation of the workshop at Solec it became clear that the recultivation of the former wood preservation plant could be readily solved by using a well-developed soil washing technology which is only directed to improvement of the environment. Further the Polish legislation demands that after the remediation period the soil is left as it is for five

years, without economic redevelopment of the site as such. The goal of this legislation is not clear to the members of the HOMBRE team, as economic redevelopment of a former Brownfield site is regarded within the HOMBRE philosophy a strong driver to come to the new use phase of a former Brownfield site.
Within this philosophy the Technology Train concept is developed in which the remediation of treatment technology of the Brownfield site is coupled to a technology that will be used in the redeveloped site, like the Technology Train of sustainable energy production and groundwater treatment in the combination ATES and groundwater bioremediation. As at this site a strict disconnection is needed between the remediation phase of the Brownfield and the re-use phase after the remediation it was decided to reformulate Golden Question 4 to: How can the answers to questions 1, 2 and 3 be combined?

The Golden Question 4 was experienced the most difficult question by the participants.
However when the focus moved from just the former wood conservation site to a larger scale the link was made to the strategic plans for Solec Kujawski as a whole. A first strategic plan was made in 2000 after the realization of the radio-broadcasting transmitting station in 1999. This plan was made for the period 2000 -2013 and resulted in a new traffic connection below the train track, sports facilities and commercial area (see appendix 3).Recently a strategic plan 2014 -2020+ was made. For this a 3 month inventory with workshops (information, collection of wishes, negotiation to come to consensus) with all stakeholders including inhabitants of Solec was performed. Actually in the Strategic plan similar questions were already addressed implicitly, similar as compared to the Golden Questions.

The participants of the workshop had all been involved in the procedure to come to the new strategic plan.
As stated before the concept of Technology Trains did not apply to the situation at the former wood preservation site, however in the period after the recultivation of the site by soil washing the area will have a buffer function for a period of five years.

At the moment so called bio-prisms are developed at the border of the former creosote site along the rail-track. In fact the bio-prisms are hills with sandy soil from the site, which already passed the soil washing process. The residual concentrations of PAH are bioremediated by spraying water and ventilation by air. These hills up to 4 m high are lying parallel to the rail-track and function as an anti-noise screen for the area. Also it is aimed at to use these hills as tribune around a sports field that has to be developed after the period of five years of inactivity (see reaction at GQ1).

GQ5: How to organize the BF redevelopment? And GQ6: How can finances be arranged?
For the organization of the redevelopment of the Brownfield it will be necessary to adjust the Polish legislation as it is experienced by the participants that the current law blocks innovative and sustainable solutions/approaches and redevelopment of the site. An example of blocking redevelopment from Polish law is that remediation is still based on total concentrations and standards set depending on the planned land use (the A,B,C areas), which is often not affordable, but also not necessary from risks based perspective. Polish authorities require still to remediate as 'deep as possible' without risk evaluation. The participants all agree upon that risk based legislation would stimulate Brownfield redevelopment very much. In the Solec site public money is used for remediation.

To allow the use of public money for this purpose, the ecological effects of remediation should be achieved and proven. Therefore, commercial activities at the site are blocked for 5 years, otherwise private instead of public funds have to be used for remediating the site.
This legislation leads to stimulation of urban sprawl and hampers investors' participation at the initial stage of development on spatial planning. In fact this legislation leads to the opposite effects that we want to obtain form Brownfield redevelopment.

Further a positive attitude could be sensed with the participants upon redevelopment by Public Private Partnership (PPP), as public money may overcome the first step for investments by private investors to start the development of economic activities at a specific site. However at the moment PPP is experienced as an empty idea, because the Polish law is too complicated and hampers such partnerships. One of these rules is applied to tenders. Polish law only allows the cheapest offer to be carried out, which is often not the best for solving the problem. Complications and the nuances of the still evaluated law for public tenders follow to the many formal protest submissions and to delay the start of real remediation works.
Participants at the workshop would like to try PPP as a new tool in Polish society to solve environmental problems. However several stakeholders address that it should be avoided that PPP is linked to the suspicion for corruption. A clear and transparent procedure has to be invented for this procedure. It was stressed that such transparent procedure is very important to avoid the suspicion that PPP means: Public Pays for Private.