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HOlistic Management of Brownfield REgeneration (HOMBRE)

Towards the anticipation of brownfield emergence?

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In cooperation with:

CABERNET www.cabernet.org.uk

GREENLAND www.greenland-project.eu

timbre www.timbre-project.eu

GLOCOM Global Partners in Contaminated Land Management
MARIE CURIE ACTIONS
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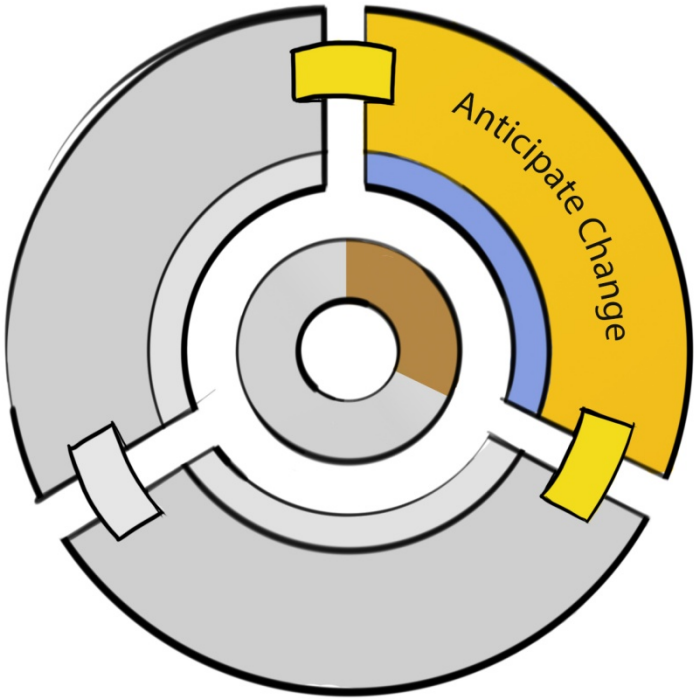
Anticipate Change



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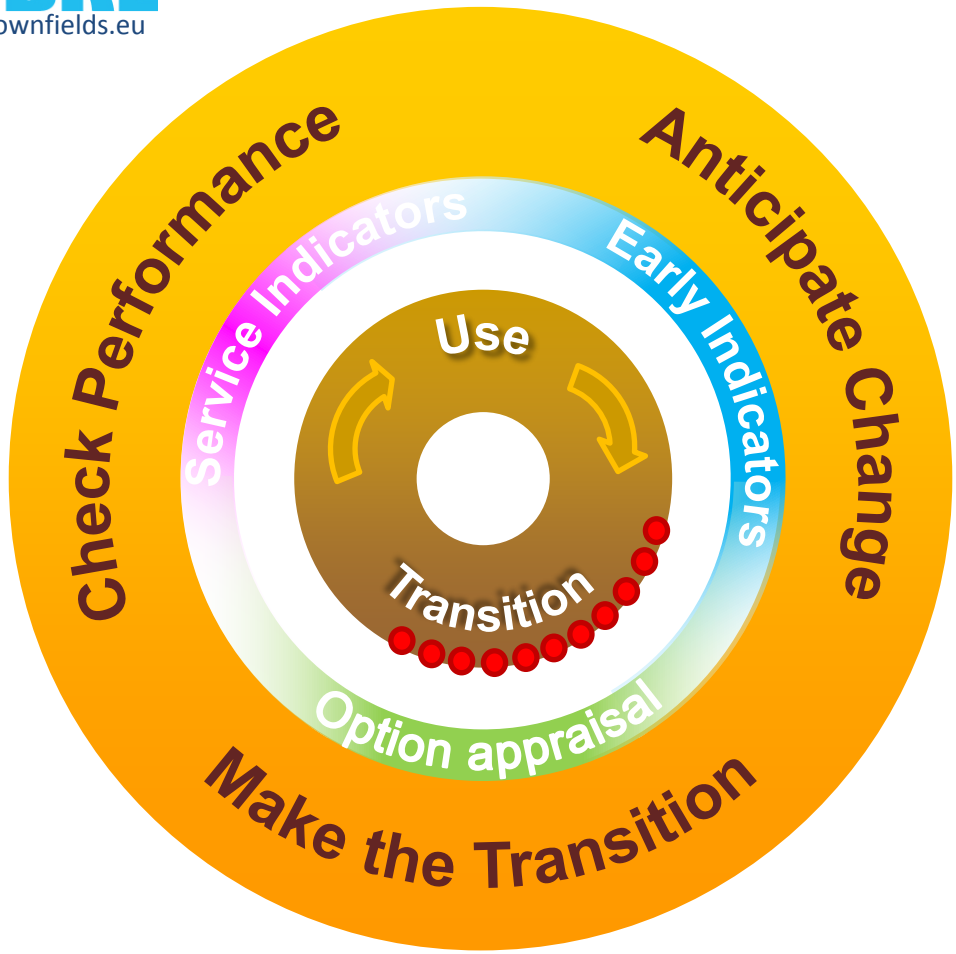

Land use cycle

Risk of BF persistence/emergence

Dominant information/decision tool

Land management cycle

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Would it be possible to predict and map the potential of brownfield emergence within European urban areas?

Would it be possible to identify zones with the highest potential for brownfield formation?

Could a generic approach be developed?

Géosciences pour une Terre durable
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Anticipating BF emergence?

- Hypothesis : could we identify potentials of brownfield emergence for specific urban units within a town from looking into the evolution of specifically chosen indicators over time?
- BRGM & Stadt+ research work:
  - Proposition of a protocol for identifying brownfield emergence potentials from general predictive model (high, medium and low potentials)
  - Protocol tested on
    - a French town – statistical approach
    - a German town – consultative and participative approach
  - Prototype MCA/visualisation tool developed and adapted for both cases

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Anticipating BF emergence method

Step 1
- Identify the boundaries of the studied urban area and smaller urban units

Step 2
- Choose the most relevant early warning indicators

Step 3
- Retrieve data & evaluate each indicator

Step 4
- Aggregated brownfield emergence
  - Statistical approach : Assess indicators independence & build general predictive model
  - Consultative approach : Build a predictive model using consultation results

Mapping and visualisation tool developed in parallel: MCA/GIS

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Tests on two case studies

- French agglomeration of 27,5 km² and 110 000 inhabitants

- German town of 19,7 km² and 16 500 inhabitants

The French case

Step 1

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

- Agglomeration boundary
- IRIS : smallest geographical units of the national statistical institute (n = 115)

Step 2

- Choose the most relevant early warning indicators

HOMBRE presents 40 early warning indicators for the anticipation of …

Step 2

- Choose the most relevant early warning indicators

HOMBRE presents 40 early warning indicators

Biodiversity
Groundwater pollution
Composition of employment
Safety
Educational level
Crime
Land use
Population wealth
Employment
System preservation
Air pollution
Property price
Available services
Noise hindrances
Social cohesion
Soil pollution
Presence & quality of green areas
l estate market
Health
Accessibility, mobility, operational efficiency

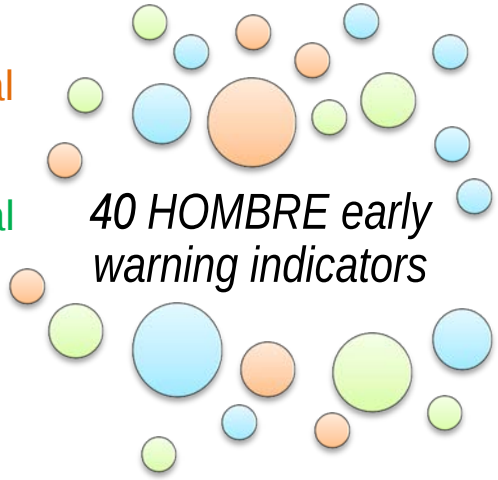
Step 2

- Choose the most relevant early warning indicators

Social

Environmental

Economic



HOMBRE Literature Review

25 selected relevant indicators (8 themes – all types of BF)

Specific urban area characteristics

The French case

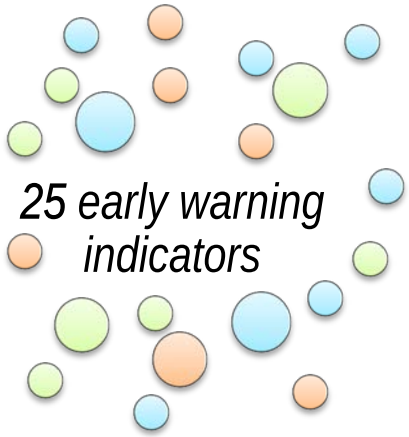
Step 3

- Retrieve data for the 25 selected indicators

Social

Environmental

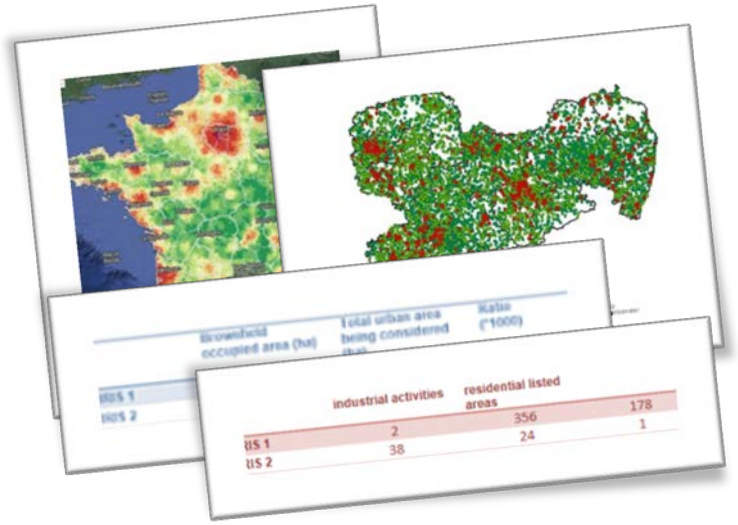
Economic



7 early indicators data sets for each urban units

Step 3

- Retrieve data and evaluate each indicator



7 indicators with available data but only related to industrial brownfields

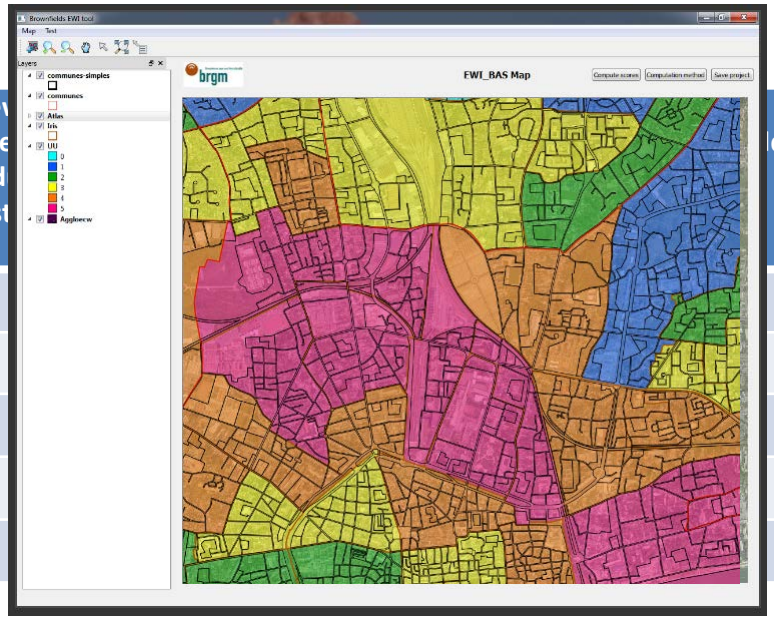
- Land value
- Total of industries
- Number of new industries
- Perception of contamination
- Discrepancies in land use
- Amount of already abandoned plots
- Distance to the nearest highway

Step 3

- Retrieve data and evaluate each indicator

A **ranking from 1 to 5 was given to each IRIS** and **for each indicator** (discretisation using the equal frequencies)

Urban unit (IRIS)	Operating industrial installation	New ope ind inst	d	Discrepan-cies in overall land use	Residen-tial land value
IRIS 1	2			5	5
IRIS 2	2			3	2
IRIS 3	1			1	1
IRIS 4	1			1	1
IRIS 5	1			1	1



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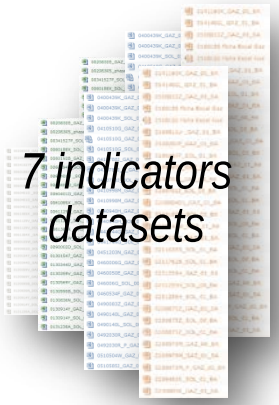
Step 4

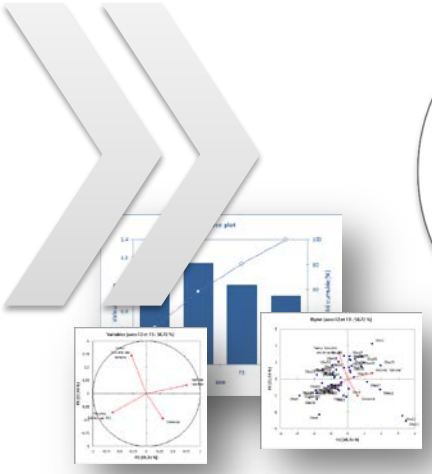
- Statistical approach : Assess indicators independence (non correlation)

Social

Environmental

Economic





Correlation analysis
(PCA)

*4 early indicators **independent** data sets for each urban units*

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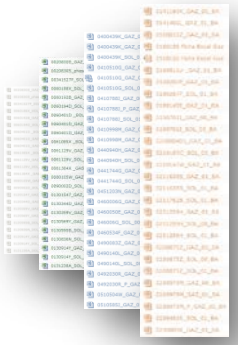
The French case

Step 4

- Statistical approach : Build general predictive model

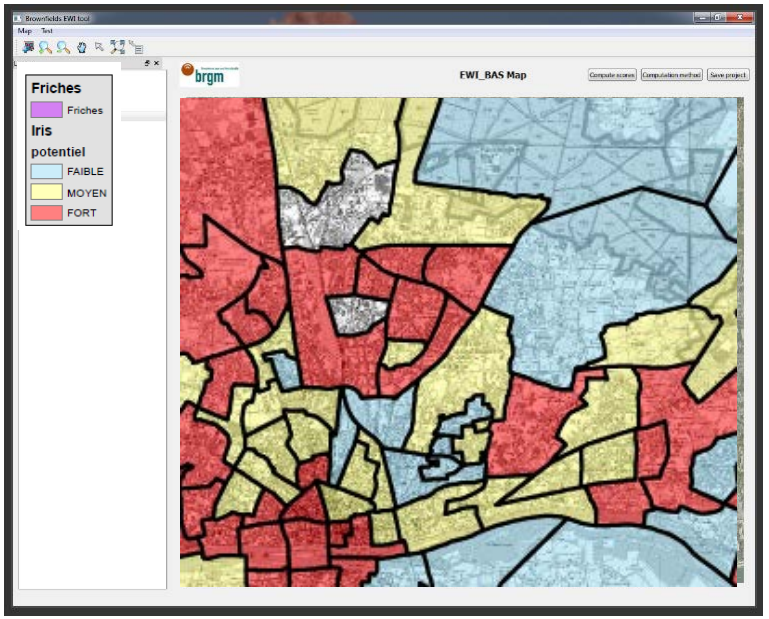


4 indicators independent datasets

Statistical treatment

$$Score = \sum_{i=1}^{4} (w_i \times s_i)$$

With for each indicator i
w_i : its weight
s_i : its individual score



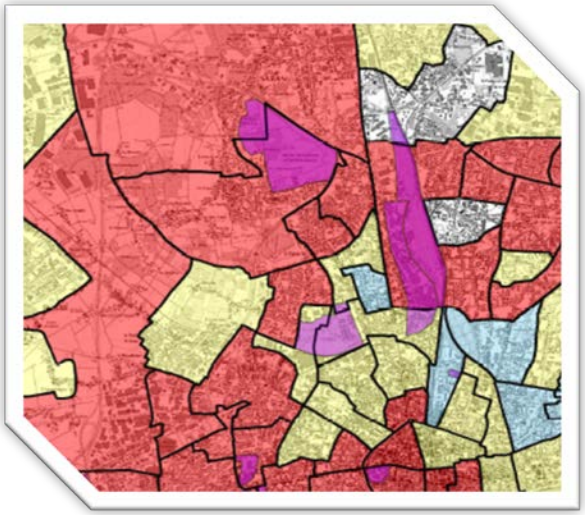
each «IRIS» => **Global note representing the emergence potential**

Step 4

- Statistical approach : Assess validity of the general predictive model

Validation score up to 71 %

Checking the results with the existing brownfields



But there are important applicability limits :

- Validation test based on hypothesis not stats
- For industrial brownfields
- Only 4 indicators
- No global indicators
- Short term application

Step 1

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

- Inner city boundary
- Urban unit : existing administrative districts

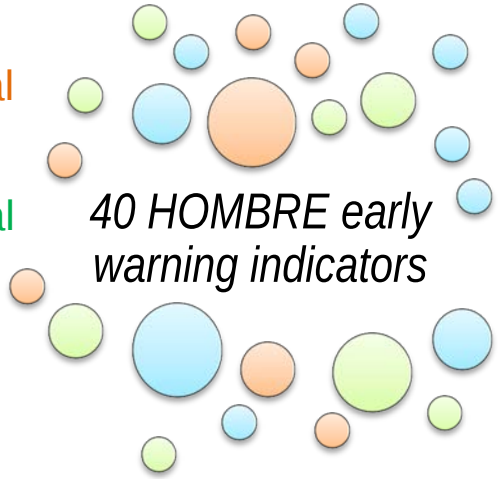
Step 2

- Choose the most relevant early warning indicators

Social

Environmental

Economic



Urban area characteristics

16 selected relevant indicators for the German study case

The German case

Step 3

- Retrieve data for the 16 selected indicators

Social

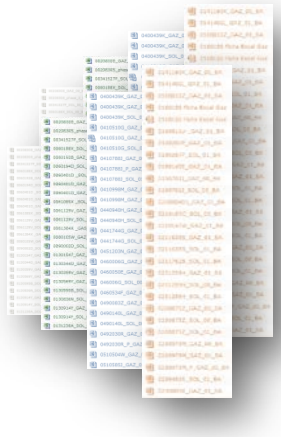
Environmental

Economic

8 early indicators data sets for each urban units

Step 3

- Retrieve data and evaluate each indicator



8 indicators with available data : All 8 linked to residential brownfields, 4 linked to industrial brownfields

- Land value
- Population composition by age
- Development to green space
- Population change
- (potential) land contamination
- Amount of already abandoned plots
- Distance to the nearest highway or train
- Access to public transportation

Step 3

- Retrieve data and evaluate each indicator

A ranking from 1 to 5 given to each urban unit and for each indicator based on available data and weighting system proposed upon experts opinions (urban planners) and local context

	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

Consultative approach:

- Obtain initial global emergence potential for each urban unit
- Test & correct the general predictive model in consultations

Weighted sum → determine the overall emergence potential in each urban unit

$$Score = \sum_{i=1}^{4} (w_i \times s_i)$$

With for each indicator i
w_i : its weight
s_i : its individual score

	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

Predicted potential of industrial brownfield emergence

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Step 4

Consultative approach:

- Obtain initial global emergence potential for each urban unit
- Test & correct the general predictive model in consultations

Provisional overall emergence potentials presented to members of the city administration in a consultation session – adapt weights

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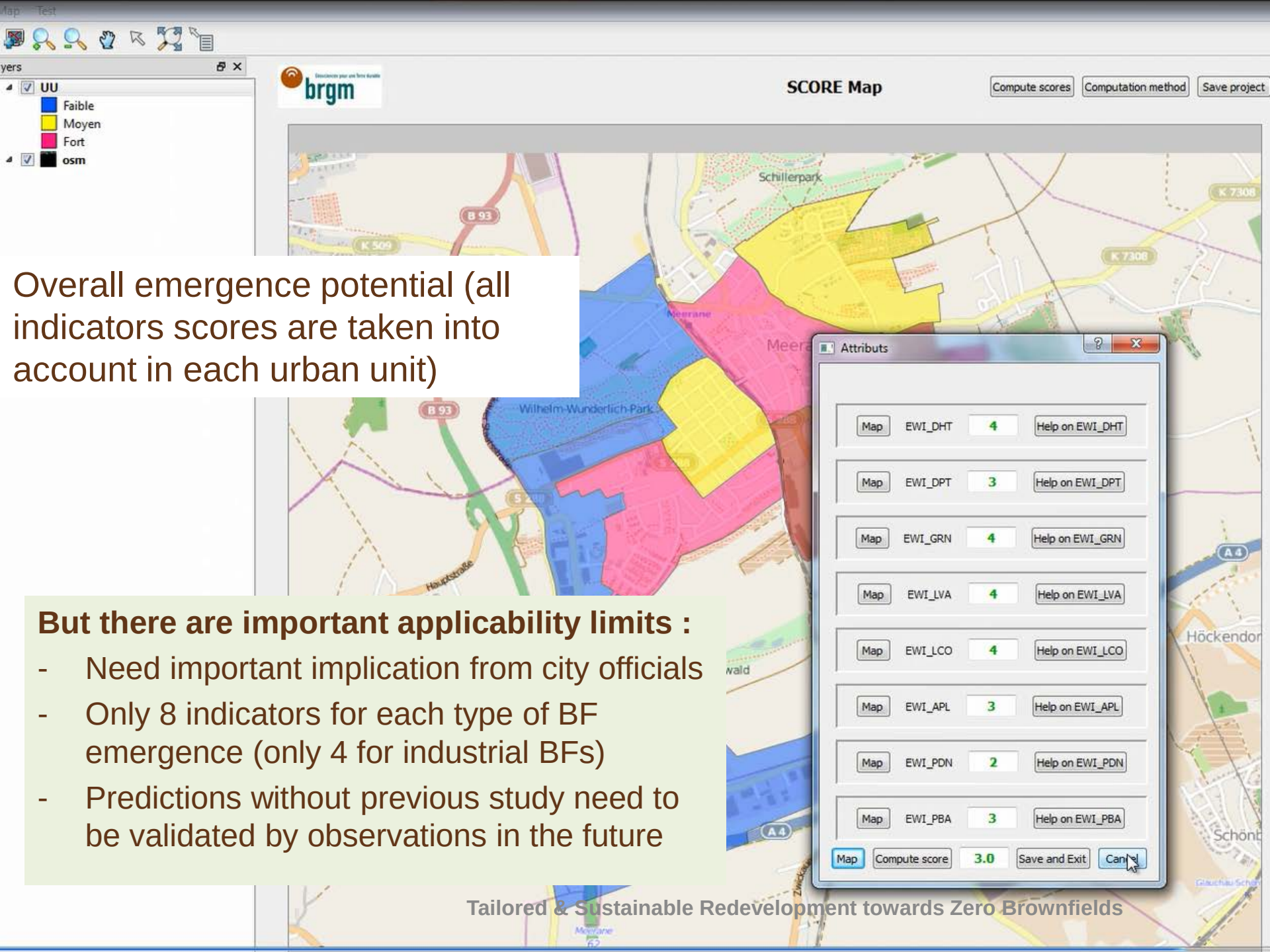
Step 4

Consultative approach:

- Review ponderation and obtain global emergence potential for each urban unit
- Test & correct the general predictive model in consultations

Engage with members of city administration (urban planning department):

- Present revised overall emergence potentials
- Discuss results (scores, weights)
- Discuss overall approach (e.g. chosen indicators)
- Discuss improvement of the visualisation tool



Overall emergence potential (all indicators scores are taken into account in each urban unit)

But there are important applicability limits :

- Need important implication from city officials
- Only 8 indicators for each type of BF emergence (only 4 for industrial BFs)
- Predictions without previous study need to be validated by observations in the future

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Conclusions

- Generic approach to predict potential for brownfield emergence has been proposed and tested on two European towns
- Prediction for short and long term each have their own limits depending on the method, available data and models built
- A prototype mapping software was developed but not easily transferable yet. However, it stresses the need that interactive maps can provide support when engaging on such matters with city officials
- It is possible to apply the generic approach to obtain prediction model for all European town when local specificities are taken into account
  - Local context should be well understood
  - Selection of early warning indicator should be adequate
  - Both statistical and consultative approaches should be used in combination
  - Relevant time series of data should be available
  - City officials should be willing to engage in the discussions (time needed)

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Perspectives

- The proposed method (also called the BoWET) can help to advance urban planning process and encourage dialog with local urban planners and agencies.
- Proper measures must be taken to adapt the approach to each local context
- Could become an important tool for supporting sustainable development in European cities→ Zero brownfield perspective a reality in the future?
- Prototype tool has potential for further use and development

More information on anticipating brownfield emergence

- The HOMBRE Deliverable D3.3 “Evaluation of test results from the Brownfield Navigator use in case studies”, Oct. 2014 under publication
- The HOMBRE Brownfield Navigator “anticipating BrOWnfield Emergence Tool”
- A short video on the cases studies (ftp://ombre:brownfield@ftp.brgm.fr/HOMBRE_demo_v0-2.mp4)

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Thank you very much for your attention

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